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The Monthly Review

Published by the AMERICAN ELECTRO-PLATERS' SOCIETY

MARCH 1938

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The Monthly Review

Published by the AMERICAN ELECTRO-PLATERS' SOCIETY

A Society for the Advancement of the Science of Electro-Plating

MARCH 1938

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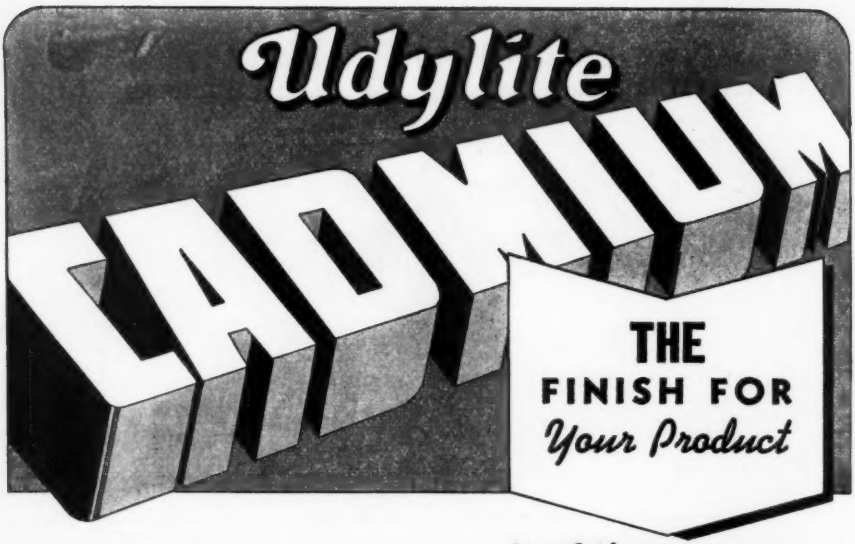

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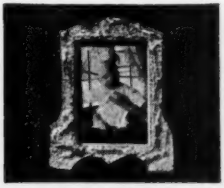

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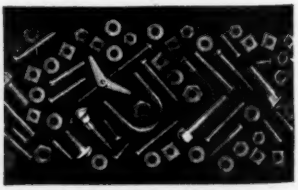

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The MONTHLY REVIEW

Published by the
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Editorial

We notice with considerable satisfaction that our members are taking keen interest in the discussion of the proposed changes in the Constitution at the branch meetings. This is manifested by the request of one of our largest branches that we supply them with copies enough so that each member may receive them. In order that no partiality is shown, we have sent enough to each branch secretary for distribution to the members of his particular branch. Each one should have a copy in his hand when the matter is being discussed, and the delegates to the convention instructed how to vote.

In visiting the various branches, the question has been asked "Why does the MONTHLY REVIEW publish papers that have been read at the convention and which are more or less stale by the time the last ones are printed when there are so many papers being read at our branches that are more interesting and up-to-date, but are not published in the REVIEW?

In the 1935 Revision of the Constitution, Article X, Sec. 1, page 10, states that the MONTHLY REVIEW shall contain all papers read before the convention and branch societies, and any other information that may be valuable to the membership. Inasmuch as we are giving awards for papers read, it is only fair to the authors of these papers that they be published in the REVIEW, since this is the only means at present of awarding the Gold Medals by the Committee appointed for that purpose by the President.

Recently we discussed this matter with a group of prominent members of Chicago Branch, one of whom stated that the convention proceedings could be printed for one dollar per copy if enough copies could be sold so that each A.E.S. member would buy one. In recent years we have been ordering two hundred copies, and selling them for $5.25 per copy which did not quite cover the expense of reporting, printing, and shipping, to say nothing of the invoicing and other correspondence that took time and money before the copies were all paid for.

A prominent member of one of our New England branches remarked that the National Society might donate the pro-

ceedings to each member, the same as kindred organizations. Our reply was that the Societies referred to could afford to do this because in one case the membership dues were ten dollars per year and in another thirty dollars, while the A. E. S. members contribute only $2.10 to the National Treasury per year per member.

It is not the intention of the A.E.S. officers to ask any member to increase his dues in order to secure a copy of the proceedings, but if a spontaneous spirit on the part of our members were manifest to the end each one would be willing to pay a dollar, then the Executive Secretary would not hesitate to order 1600 copies, have the publisher mail the copies to each branch secretary according to the number of members in the branch, let the Secretary be responsible for the number received, and send a check for the full amount, the same as he does when ordering branch supplies, to the Executive Secretary.

More work for the Editor you say? Yes, but why withhold from other branches the fine material read before one particular branch? Why not let the entire membership have the benefit? All we need is the cooperation of our membership to make this feasible. The Editor is anxious to see the REVIEW as up-to-date as other publications and has no worries regarding the securing of the kind of material our members want, but he feels as though he is handicapped under present conditions.

It is only fair to say that we have checked and rechecked with other publishers the price mentioned by our Chicago members and agree that the work can be done for this figure. However, unless each one is interested in the facts mentioned nothing can be done, as we cannot take any chances in ordering 1600 copies and find that only half our members are willing to purchase them. It is essential therefore that we approve the plan 100 per cent before going ahead.

Think it over, fellow members, and see if you could spend a dollar to better advantage.

BRANCH SECRETARIES

Please send your membership lists to the Executive Secretary's office.

This is necessary in order to get a complete report before the end of the fiscal year.

Something New *in* Silver Plating

By DONALD WOOD
Reed and Barton Corporation

Read at the New York Convention 1937

It is the purpose of this paper to describe a slight variation of the conventional silver plating solution, which has been in experimental use at Reed and Barton Corporation for about a year. The essential difference between this type of solution and the usual one is that it contains potassium nitrate at a concentration in the order of 16 ounces per gallon. This addition provides the desired conductivity, in the absence of appreciable carbonate. Rather low metal and free cyanide content is possible. The advantages of a potassium solution are available at even less than the cost of the usual sodium solution. And the character of deposit from this solution, especially with carbon disulphide brightener, is superior to that obtained from either the sodium or potassium carbonate solution. Experience with this type of solution covers so short a period that improvement is to be expected; but a typical and satisfactory formula is:

Silver Nitrate	4 oz/gal (avoir)
Sodium Cyanide	4 oz/gal
Potassium Nitrate	16 oz/gal

Cost: To allow a comparison of costs, the following formula is calculated to produce a conventional type of solution having analysis near the middle of the limits recently prescribed by Mesle:

Silver Cyanide	5 oz/gal (avoir)
Potassium Cyanide	7½ oz/gal
Potassium Carbonate	4 oz/gal

On the present market (3/5/37) this solution costs $251.00 per 100 gallons. In comparison, the cost of the potassium nitrate solution is $142.00 per 100 gallons. If the value of the silver is deducted in each case, the resulting net costs are $74.00 per 100 gallons and $30.00 per 100 gallons respectively. Entirely satisfactory results and a further reduction in cost are obtained by dissolving anode scrap to obtain the silver nitrate. Of the $30.00 above, $19.00 is the differential between the cost

of silver as metal and as nitrate. This represents no doubt a fair price for the preparation of the usual well-packaged, crystallized, C. P. material. On the other hand, $4.00 of the $19.00 will cover the cost of the commercial nitric acid and the labor required to put the silver in solution. Surprisingly, a stainless steel pail proves very satisfactory as a container for the operation. Excess acid is held to a minimum and this, neutralized with sodium hydroxide. Extreme care is not necessary in this operation, but an appreciable excess of the alkali is undesirable. Using this method the cost drops to $15.00 per 100 gallons if the value of the metal is deducted, or $127.00 per 100 gallons, total cost. The ratio of costs then is about 1 to 2 or 1 to 5 depending upon the method of accounting.

MAINTENANCE AND CONTROL

Although no advantage is apparent if a new solution is made with potassium cyanide (but otherwise the same), it is advantageous to compensate for decomposition and drag-out with potassium rather than with sodium cyanide. This is not entirely necessary but a large increase in sodium salts should be and can be avoided in this manner. Carbonate occurs as usual by decomposition of the cyanide. This is held to a small value by precipitation with calcium nitrate. A fertilizer grade, a Norwegian export, and costing about 4 cents per pound is used. Because it is very important not to have an excess of the calcium nitrate left in solution, this precipitation is calculated to leave about .15 N carbonate (1 ounce per gallon as sodium carbonate) in solution. In practice, the dry calcium nitrate is added to the solution which is then vigorously agitated for several hours with a quarter horsepower "lightning mixer." Precipitation occurs very nearly at the theoretical rate (1.55 oz per gallon calcium nitrate to remove .14 N carbonate) (1 oz per gallon as sodium carbonate). After settling overnight, the solution is pumped off, the tank cleaned and the solution filtered back in.

Control of this type of solution is slightly complicated by the presence of the nitrate. The method used is something of a makeshift but works very well. The usual analyses for silver, free cyanide, and carbonate are made. The nitrate is estimated from a determination of specific resistivity, using a Haring cell. Rough curves such as shown in Figure 1 are derived by adding

known amounts of potassium nitrate to typical solutions and plotting the measured specific resistivity values against the potassium nitrate concentration. Error will be introduced in this method when any of the other constituents vary from the assumed constants or when impurities have accumulated; but as the potassium nitrate concentration is not critical, the method is adequate.

Where both sodium and potassium salts are present, the concentrations of carbonate and free cyanide can not properly be expressed in ounces per gallon. It is found much preferable to consider all determinations in terms of normality.

OPERATING NOTES

With the usual type of agitation and operating between 75 and 80 degrees F. uniform bright plate is obtained on flatware at from 12 to 18 amperes per sq. ft., average, and on hollowware at from 7 to 10 amperes per sq. ft. average. As with the conventional solution, higher current density is possible, but uniformity of deposit is sacrificed. With this solution the lower limit of uniform bright plate is not so marked as with the conventional solution.

A brighter color is obtainable by reduction of the free cyanide to .15 to .20 N. At this concentration anode polarization may become a problem and no advantage is evident in the finishing of the deposit. If the free cyanide content is increased about .5 N, a milkier deposit results.

Concentration of silver is best held above .15 N (2 troy ounces per gallon) but little limitation in average current density is evident .13 N (1.75 troy ounces per gallon).

It is suggested that carbonate be removed when the concentration reaches .4 N, a slight change in the character of the deposit becoming apparent at a concentration of about .5 N.

Filtration becomes very important in this type of solution and should be done in the presence of a filter aid of the Diatomaceous type.

THEORY

The potassium nitrate solution is the result of a theory on the action of carbon disulphide brightener. It was observed, when brightener was added to a plating solution containing an addition of sodium hydroxide, that a slight precipitation occurred,

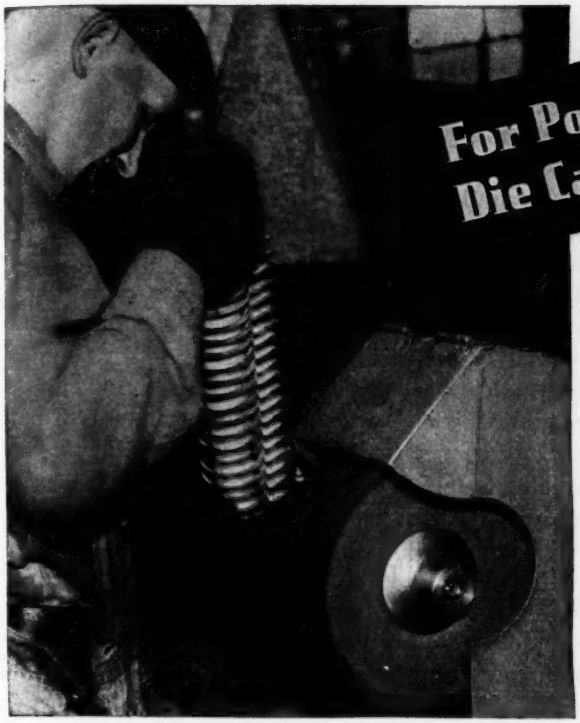
and that very little brightness could be maintained. This suggested that ordinarily a colloidal precipitate was formed.

Although it was determined that the composition of the observed precipitate varied slightly from that of silver sulphide, it was assumed tentatively that the effect of the brightener was to produce a dispersion of colloidal size particles of silver sulphide in solution. If such particles migrate to the cathode and deposit as sulphide, they should be reduced at once to the metallic state. It appears a reasonable hypothesis that metal resulting from the reduction of sulphide, deposited by cataphoresis, should differ in orientation from that deposited as metal; thus providing the interference with free growth necessary to produce bright plating. If the effect of the brightener is according to this hypothesis it should be possible to vary the rate of migration of the solid phase and thereby the character of the deposit by varying the otherwise neutral ingredients of the solution. A typical example of such a variation would be to substitute all potassium salts for the equivalent sodium salts. To allow observation of the effect of such variations, a series of plant size solutions (300 to 400 gallons) were made and operated over a period of from 3 to 9 months. A wide variety of work was handled through these solutions, current density and temperature relations were observed, and the effect of brightener additions noted. On this scale a very satisfactory comparison was possible in contrast to the fact that only very unsatisfactory comparisons were found possible in the laboratory.

Based on this comparison, the experimental solutions are listed in the order of the brightness found obtainable:

Potassium Nitrate
Potassium Carbonate
Sodium Carbonate
Potassium Chloride
Sodium Hydroxide
Sodium Nitrate
Sodium Chloride

To insure against interpreting, as due to selective absorption, a variation caused possibly by change in conductivity or polarization, extra precautions were taken in the comparison of the potassium nitrate and sodium nitrate solutions. These were



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first made chemically equivalent. Cathode polarization/current density curves were drawn from measurements in a Haring cell, modified slightly to allow agitation. These curves were identical and no change occurred when further sodium nitrate was added to make the conductivities equivalent. Operating side by side, chemically and electrochemically equivalent, these solutions had no similarity whatever. The potassium nitrate solution produced lustrous bright deposits over a wide range of operating conditions, and the sodium nitrate solution had so narrow a bright range as to be entirely worthless.

So frequent reference has been made to brightness that an explanation is in order. No matter how bright a silver plate is produced, it is subjected to a buffing operation. For this reason the superficial appearance is of little practical importance. The ease of finishing depends rather on the flatness of the deposit and the absence of texture. A glass-like quality with a milky color is considered preferable to a brighter color with a more crystalline character. Evaluation is easily accomplished by observing the luster obtained by a very soft scratch brushing operation. It is brightness of this nature which has been intended when the word has been used.

It is well known that when carbon disulphide brightener is added to a silver solution, the cathode polarization is decreased. It is not so generally known that the decrease in polarization is of shorter duration than the brightening action. Fig 2 indicates the temporary nature of this effect of the brightener, and is offered in support of the opinion that the two effects of the brightener are independent. Further evidence is found in the fact that a very dilute sodium sulphide solution added as brightener to a conventional solution produces no brightness, but causes a temporary decrease in cathode polarization comparable to that caused by ordinary brightener. Potassium cyanate is observed to act in the same manner. This phenomenon is not understood, but apparently need not be considered as complicating the evidence that a solid colloidal phase is produced.

To avoid digression, it was assumed tentatively that the dispersed material was silver sulphide. Although it appears to differ only slightly from this composition, it is probable that a more complex substance occurs first, which gradually decomposes to the sulphide. Xanthate has been suggested as a fairly

Fig. 2

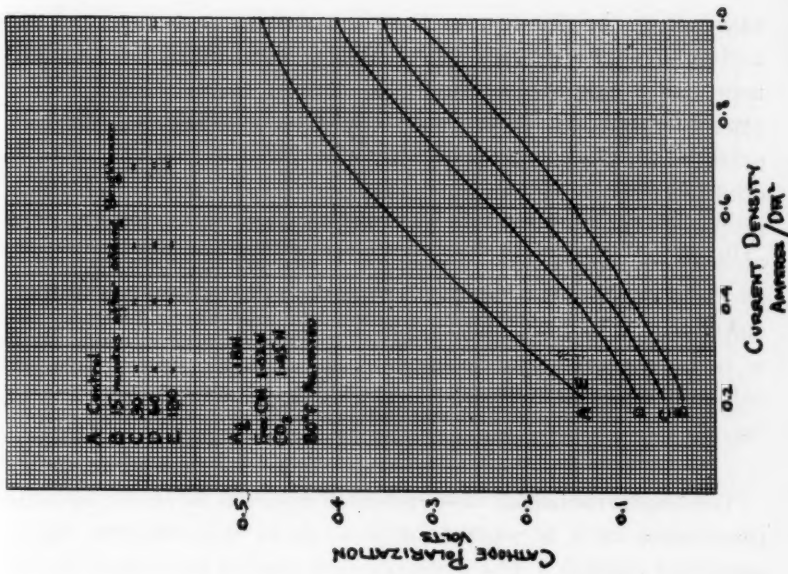
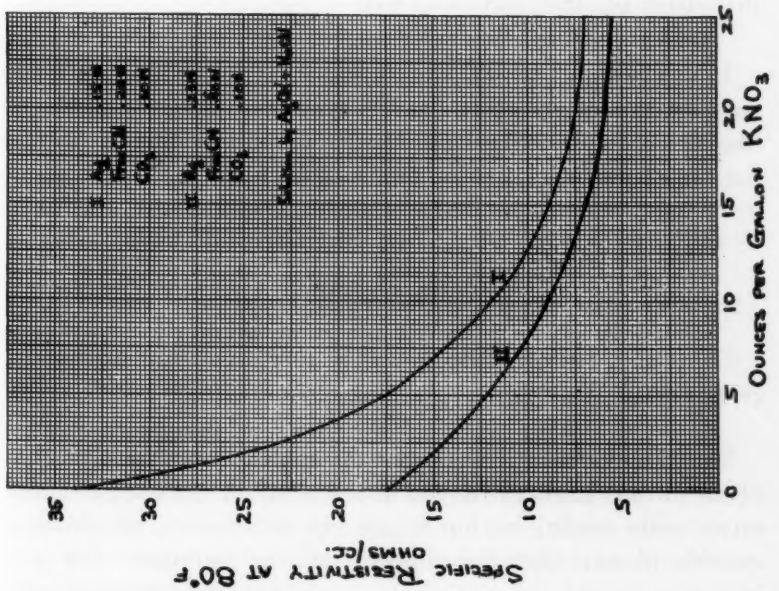

Cathode Polarization
Volts
0.5
0.4
0.3
0.2
0.1
Current Density
Amperes/Dm²
0.2
0.4
0.6
0.8
1.0

Fig. 1


Specific Resistivity at 80°F
ohms/cc.
35
30
25
20
15
10
5
Ounces per Gallon KNO_3
0
5
10
15
20
25

satisfactory brightener, and as a possible constituent of the carbon disulphide brightener. Where the brightener is made, using only cyanide solution and carbon disulphide, it is improbable that an Alkyl group could be synthesized. On the other hand, the similar inorganic salt, Thiocarbonate, could undoubtedly occur in the brightener. This material has been prepared and found to act as a brightener. It is stable in the absence of water but decomposes slowly in solution, more slowly if cyanide is present. The silver salt decomposes to form sulphide. Where all the factors are so unstable, no conclusion is to be expected, but it appears reasonably possible that the colloidal material may be a silver Thiocarbonate, $Ag_2\ CS_3$ or $Ag_2\ COS_2$.

The exact nature of this colloidal material is really of little importance as it is much simpler to make it in the customary ampirical manner. The evidence that a solid dispersion occurs and can be controlled to vary the character of a deposit may be of value not only in silver plating but as a possibility in the deposition of other metals as well.

In conclusion, I should like to acknowledge the assistance and collaboration of my assistant, Mr. John D. MacLean. I should like also to express thanks to the Reed and Barton Corporation for its generosity in allowing publication of this work.

DISCUSSION

CHAIRMAN SMITH: The paper is now open for discussion, gentlemen.

MR. SODERBERG: The thing that comes to my mind is that silver nitrate itself gives you 100% efficient deposition under rather wide conditions, but if you put nitrate into an ordinary cyanide plating bath for copper, zinc, or cadmium, you will immediately get a very definite lowering of the cathode efficiency.

I am just pointing this out to warn you not to try and compound other cyanide plating baths with nitrate.

DR. BLUM: Regarding that last point of Mr. Soderberg's, although we have no first-hand information, it is probable that nitrate would have the least effect on the cathode efficiency in silver deposition, because silver is deposited more easily than nitrate is reduced in such a solution. I just want to call attention to the fact that if a solution containing a large amount of potassium nitrate is satisfactory for silver plating, the approximate content of the potassium nitrate could easily be determined from a density determination. The specific gravity could be determined after you have determined the silver and carbonate, which must be controlled anyway.

DELEGATE WOOD: On the question of cathode efficiency, I did not mention that in the paper because our work indicated that there is no significant change in cathode efficiency, using the nitrate. I am very glad that Dr. Blum pointed out the possibility of the density measurement. The reason we use the resistivity measurement is that it is part of our routine control and is very simple to use as a means of checking the nitrate.

DELEGATE HIRSCH: I think the suggestion of the possibility of silver sulphide acting as a brightener is one that should be investigated just a little further, and that perhaps a little ultra-microscopic examination will tell whether there is a silver sulphide there. There has been some experimental work done by the addition of colloids to plating solutions. The one I have in mind is a copper solution and in that case colloidal additions made no change on the structure of the deposit.

Have you made any ultra-microscopic examinations of that? It is very difficult to do.

DELEGATE WOOD: No, not with an ultra-microscope. I was not as much interested in the nature of the colloid present as in the fact that its migration could be controlled to affect the character of the deposit.

Brass Plating *by the* Bridgeport Branch *of* A.E.S.

By WALTER R. MEYER
Librarian

Read at the New York Convention, 1937

THIS paper attempts to give a composite picture of brass plating as it is practiced by the members of the Bridgeport Branch of the A.E.S. This Branch is fortunate in having many members whose plating experience dates back from twenty to fifty years, and although credit for the information contained herein is due to the entire membership of the Bridgeport Branch, particular credit must be given to the following members: Bill Stratton, Joseph Sexton, Ray O'Connor, George Wagstaff, Ben Kusterer, William Flaherty, John Charleson and Joseph Sterling, who all contributed freely to the discussions upon which this paper is based.

Brass plating is used chiefly as a finish plate on hardware, lamp fixtures, etc., but some brass deposits are made as undercoats for nickel deposits, for oxidizing and for bonding of rubber to steel.

COMPOSITION OF SOLUTION

A typical brass plating solution is composed as follows:

Copper cyanide	3.6 oz/gal
Zinc cyanide	1.2 oz/gal
Sodium cyanide	7.5 oz/gal
Sodium carbonate	4 oz/gal
Ammonium hydroxide	1 pint per 100 gal.

COPPER CONTENT

The copper cyanide content of 3.6 oz/gal represents an average value employed. Changes in copper content do not affect the color of the deposits to any noticeable extent if the proper copper-zinc ratio is maintained. Brass solutions with high copper contents (3.5-5 oz/gal CuCN) give higher cathode efficiencies (80-95%) than solutions with lower copper contents (1.5-2 oz/gal CuCN) which give efficiencies from 50-75% with current densities up to 2.5 amps/ft^2. Barrel brass solutions contain

4 oz/gal of copper cyanide. The metal is usually added as cuprous cyanide rather than as a carbonate.

ZINC CONTENT

The zinc content is dependent upon the copper content and the composition is so adjusted so that the weight ratio of metallic copper to metallic zinc should be 4 to 1, or the ratio of CuCN to $Zu(CN)_2$ be 3 to 1. The deposit will not necessarily come out with this same ratio, but tests extending over the past four years indicate that the deposit will analyze between 70% and 80% copper and the balance zinc. Electrodeposited brass analyzing 80% copper will have about the same color as cast high brass containing 65% copper and 35% zinc. This optical difference is probably associated with the sub-microscopic crystal structure of electrodeposited brass.

Serious difficulties may occur if the zinc content is too high or if anodes with a too high zinc content are used. Excessive sludge formation at the anode will occur together with an increase in anodic polarization. Good deposits are difficult to obtain with high sodium carbonate contents if the zinc content is also high. Pink colored deposits may result, especially in cold solutions, from a too high zinc content as well as from a too low zinc content. Thus, brass deposits containing either above 40% zinc or below 20% zinc may have a reddish color.

FREE CYANIDE CONTENT

Good results have been obtained by keeping the free sodium cyanide content between 1.5 and 2.5 oz/gal. When free cyanide is low, marked anodic polarization occurs with a decrease in anode efficiency and when it is too high the cathode efficiency is reduced. The percentage of zinc in the deposit falls somewhat with an increase in free cyanide.

SODIUM CARBONATE CONTENT

The many effects of sodium carbonate and a correlation of these effects with free cyanide, etc., have not been fully studied. The harmful effects of sodium carbonate are lessened by high free cyanide and metal contents, by operating the solution warm, and by using 80:20 brass anodes. Best results are obtained when the sodium carbonate content is between 4 and 10 oz/gal.

High carbonates increase the anode sludge formation, have little effect on cathode efficiencies, but effect the zinc content of the solution and deposit.

To prevent the excessive formation of carbonates, brass solutions should not be operated above 105° F and metallic cyanides should be used in place of carbonates for replenishing of metal.

AMMONIA

Ammonia is added when making a new brass solution and ½ pint of con. ammonium hydroxide is added daily to every 100 gal. of solution. Ammonia is almost indispensable for the maintenance of proper color and does so because of its buffering action to maintain the proper pH and because of its ability to form soluble complexes with copper and zinc.

CAUSTIC SODA

Caustic soda may be advantageously added in small amounts to raise the pH, to increase the zinc content, and to increase conductivity. The percentage of zinc in the deposit is increased by adding caustic soda but the cathode efficiency decreases slightly. Regular additions of caustic soda are not recommended unless the pH is too low.

SODIUM BICARBONATE AND SODIUM BISULFITE

These chemicals are sometimes added to brass solutions with good results if the pH is too high, because they are acid salts and hence neutralize some of the free caustic soda. If the pH is already at the proper value, the addition of sodium bicarbonate or bisulfite may do more harm than good.

ARSENIC

Arsenic is frequently used as a brightener or whitener in brass solutions, but it is difficult to control. About ¼ oz. of arsenic oxide is used to 100 gal. of solution. The arsenic oxide is dissolved in a solution containing twice its weight of caustic soda to form sodium arsenite, Na_3AsO_3. The brightening effects of arsenic are due to several factors. First, it co-deposits with the brass to interfere with the sub-microscopic crystal growth of the alpha brass lattice, and secondly, it exerts some electrochemical effects at the cathode, such as a change in the hydrogen

deposition potential to raise the cathode efficiency, and at certain concentrations to increase the percentage of zinc in the deposit.

PHENOL

Phenol is occasionally used as a brightener in brass plating in concentrations from .05 to .10 oz/gal. The addition of phenol to the plating bath causes a reduction in the percentage of zinc in the deposit.

METALLIC ADDITION AGENTS

Small amounts of nickel will have a brightening action on brass deposits similar to arsenic, but nickel does not have any appreciable effect on the cathode efficiency or on the ratio of copper to zinc in the deposits. Lead salts will give a brightening action when added in small amounts (.01 g/l) but larger amounts will cause dark, non-adherent or brittle deposits, and at the same time will coat the anodes to increase the resistance. Tin salts in small amounts produce a dull plate.

CURRENT DENSITY

The usual operating current density range is from 2 to 5 amp/ft^2 but in warm solutions (105° F) current densities up to 15 amp/ft^2 have been used. Blistering troubles have been experienced especially when plating on zinc or lead alloys, when too high current densities have been used, due to either the co-deposition of basic salts or of hydrogen with the brass. Higher current densities can be used in warm solutions high in metal than in cold solutions low in metal. There is a marked drop in cathode efficiency as the current density is increased. The existing information in the literature on the effect of current density on the copper zinc ratio in the deposit is inconsistent. Blum and Hogaboom* state: "Unless considerable free cyanide is present, it is easier to deposit copper than zinc, hence the normal deposit contains a higher proportion of copper than does the solution. Increasing the current density decreases the copper content of the deposit. This may be readily confirmed by noting that on inaccessible parts, such as the back of the cathode, where the current density is low, the deposit is reddish and high in copper."

On the other hand, Coats** showed by analysis of brass

* Blum & Hogaboom — "Principals of Electroplating" — Page 381, 1930 Edition
** H. P. Coats — "MONTHLY REVIEW" — A.E.S., Vol. 24 No. 1, Page 17

deposits on the outside and inside of a tea-cup shaped cathode that the outside, where the current density was higher, averaged 30% zinc, while the inside, which had a lower current density, averaged 45% zinc and was a high-zinc red brass. Coats' brass solution analyzed .81 oz/gal of free cyanide and had a pH of 12.1. Recent experiments made by the writer, using a brass solution containing .5 oz/gal of free cyanide and a solution containing a copper-zinc ratio of 97% copper-3% zinc gave deposits analyzing 85% Cu-15% zinc when a current density of 1 amp/ft^2 was used. Using a brass solution containing a ratio of copper to zinc in solution of 80-20, and a free sodium cyanide content of 1.5 oz/gal, the deposits analyzed 27% zinc when 3 amps/ft^2 current was used and 18% zinc when 6 amps/ft^2 was used. A platinum cylindrical cathode was used and the deposits inside the cathode contained about 5% more zinc than the outside deposits. From this we may conclude that with free cyanide contents from .5 to 1.5 oz/gal in the normal solutions, raising the current density causes a decrease in the zinc content of the deposits or an increase in the copper content.

TEMPERATURE

Very little accurate data are available on the effects of temperature variations on anode and cathode efficiencies, composition of deposit, etc. Scattered observations lead us to the following temporary conclusions: Temperature has no consistent effect on anode efficiency, but raising the temperature from 70°F to 100°F will increase the cathode efficiency; elevating the temperature causes a slight increase in the copper content of the deposit, but this factor is also influenced by the sodium carbonate content. An operating temperature within 5°F of 100°F has been found to be most satisfactory for uniform functioning of brass solutions.

pH IN BRASS PLATING

The optimum pH value of the operation of brass plating solutions is somewhat dependent upon the amount of impurities present in the bath, particularly lead. For baths which are made up of chemically pure salts, excellent uniform brass deposits can be obtained in the pH region from 9.8 to 12.5. But

for most commercial salts, good deposits of brass are only obtained between a pH range of 9.8 to 10.3 and above 12.5. In the region from 10.4 to 12.5 the deposits become somewhat spotty and non-uniform. The beneficial effects of the addition of ammonia to brass plating baths is associated with the maintenance of the proper pH value. Additions of ammonium salts reduces the pH of brass solutions to that value which is necessary for the deposition of perfect brass deposits in that they act as buffering agents.

ANODES

The 80-20 annealed brass anode is recommended for the proper maintenance of copper zinc ratio and for the avoidance of insoluble "metallics" which are usually encountered with the cast brass anodes. Anodes higher in copper corrode better than those high in zinc, giving less sludge and hence greater percentage of the metal going into solution.

BARREL BURNISHING OF ELECTROPLATED BRASS

Very frequently an excellent barrel burnishing job must be done on brass to obtain a finish resembling gold. This finish is obtained by first bright dipping the brass in the usual nitric acid-sulfuric acid bright dip to which a small amount of hydrochloric acid has been added. A more uniform bright dipping job can be obtained if hard wood soot is added to the bright dip. After bright dipping, the work, if small, may be put into either a vertical barrel or a horizontal barrel together with an equal or greater volume of steel balls than the volume of the work. Neutral soap chips are used as a burnishing medium, and particular care must be taken that the steel balls are perfectly clean and free from insoluble soaps or grease and, in places where the water is particularly hard, a small amount of tri-sodium phosphate is frequently added, together with the chip soap. The work is ball burnished from 30 to 45 minutes at 20-30 r.p.m. for the vertical type of barrel, and from 30 to 35 r.p.m. for the horizontal type of barrel. The horizontal type of burnishing barrel must be used for burnishing bulky work to prevent excess bumping during the burnishing operation.

ANALYSIS OF BRASS PLATING

The methods of analysis of brass plating solutions are rather straightforward for copper, zinc and sodium carbonate, but there has been some confusion as to the determination of free and total sodium cyanide. Hogaboom has found that the presence of sodium carbonate interferes with the free cyanide titration by silver nitrate, and that if the sodium carbonate is removed, accurate results can be obtained with the normal titration.

ANALYSIS OF BRASS PLATING SOLUTIONS

Copper Measure accurately 10 cc of the plating solution into a 500 cc Erlenmeyer flask. Add 20 cc of 1-1 sulphuric acid and boil to appearance of dense white fumes. Cool, add 3 cc of concentrated nitric acid and transfer to a 200 cc electrolytic beaker. Dilute to 150 cc and electrolyze for at least two hours at .2 amps. Test solution for complete removal of copper with a sodium sulphide ($Na_2S.9H_2O$) solution.

Zinc The zinc is determined from the above solution after the removal of copper. Add a slight excess of ammonium hydroxide (NH_4OH), warm to precipitate the iron, and filter. Wash precipitate with hot water. Add a slight excess of concentrated hydrochloric acid (HCl) and 10 grams of NH_4Cl to the filtrate. Heat to 80°C and titrate with .1N potassium ferro-cyanide, $K_4Fe(CN)_6$ until a drop gives a light brown color on a spot plate. Use uranium acetate as an outside indicator. Run a blank and subtract this reading from previous titration.

CALCULATIONS

oz/gal CuCN	Grams Cu on cathode x 18.88
oz/gal $Zn(CN)_2$	Normality x .787 x cc $K_4Fe(CN)_6$

STANDARDIZATION OF FERROCYANIDE SOLUTION

The potassium ferrocyanide is weighed roughly (14.5 gms. hydrated salt per liter) and then standardized with C.P. 20 mesh zinc. Weigh accurately about .1 gm of zinc and dissolve it in hydrochloric acid. Dilute to 200 cc in an Erlenmeyer flask, add 5 gms. of ammonium chloride and 5 cc HCl. Heat the solution to 80°C and titrate with $K_4Fe(CN)_6$.

The end point is the same as for the zinc determination.

$$\text{Factor} = 1 \text{ cc of ferrocyanide} = \frac{\text{wt. Zn}}{\text{cc ferrocyanide used}}$$

$$\text{Normality} = \frac{\text{Factor}}{.0327}$$

FREE CYANIDE

1. Pipette a 10 cc sample into a 250 cc beaker.
2. Add 100 cc of distilled water and warm.
3. Add 10% barium nitrate $Ba(NO_3)_2$ solution while stirring, until no more precipitate of barium carbonate ($BaCO_3$) is formed. Each cc of the $Ba(NO_3)_2$ solution will precipitate an amount of carbonate equivalent to $\frac{1}{2}$ oz/gal of sodium carbonate.
4. Allow to settle, filter and wash with hot water, collecting the filtrate in order to determine whether all the $BaCO_3$ was precipitated. Save the filter paper and precipitate for the carbonate determination.
5. To the filtrate add 5 cc of 10% potassium iodide (Kl) solution. Titrate with standard 0.1 N. silver nitrate ($AgNO_3$) solution until a faint yellowish turbidity persists. The standard $AgNO_3$ is prepared by weighing out exactly 17.00 gms. of the C.P. salt and dissolving in distilled water, after which it is diluted to exactly 1 liter in a volumetric flask.

The sodium cyanide (NaCN) in oz/gal is equal to: 0.131 x cc of 0.1 N. $AgNO_3$ required for sample.

CARBONATES

1. Transfer the filter paper and precipitate from above to the beaker in which the carbonate was precipitated.
2. Add 50 cc of distilled water and a few drops of 0.2% methyl orange solution.
3. Titrate with approximately 1.0 N hydrochloric acid (HCl) until a permanent pink color is obtained.

The HCl is prepared by diluting 83 cc of C.P. acid to 1 liter and standardizing as follows: A 5 cc sample of the HCl is pipetted into a 250 cc Erlenmeyer flask and 50 cc of distilled water are added. A 2% sodium hydroxide (NaOH) solution is added drop by drop until the solution is neutral to litmus. 1 cc of 2% sodium chromate (Na_2CrO_4) solution is added and the solution is titrated with standard 0.1 N silver nitrate until a red precipitate just forms.

$$\text{Normality of the HCl} = \frac{\text{cc of 0.1 N } AgNO_3 \text{ required}}{50}$$

The sodium carbonate (Na_2CO_3) in oz/gal is equal to: (0.706 x Normality of HCl) x cc HCl required for sample. The figures inside the parentheses represent the factor for the standard HCl solution.

CHAIRMAN SERVIS: You have heard the paper on brass solutions by Mr. Meyer. Are there any questions?

DELEGATE J. W. HANLON: Mr. Meyer, have you had any experience, in your use of arsenic as a brightener, with the combination of arsenic-carbon dioxide, a portion of the regular solution and about one ounce of chloroform to a gallon of stock?

DELEGATE MEYER: No, Mr. Hanlon, we have not, and that was never brought up at the meetings in the discussion by our members.

MR. HALL: In the matter of adding ammonia to the brass solution, I think that addition is a little misunderstood. I doubt very much whether the ammonia there is a buffer to alkaline solutions. It is a pretty hard thing to keep ammonia solutions. We have found that out in the last few years. I do not know whether the composition of commercial salt has changed very much, but in many cases instead of adding ammonia we found it necessary to add acid. We take the precaution of checking the pH in all the brass solutions that come in the laboratory, and most platers will add ammonia to bring up the greenish salt and, as Mr. Hogaboom will verify, since the high zinc deposits also have a red color there may be no need for ammonia but a necessity for acid, instead. We have tried that where necessary, and it has done the trick.

We have taken new solutions with no ammonia except for decomposition products which are always there, and we have

added the required amount of acid to bring the pH down to the usual operating point, approximately 10.5, and got very nice results.

CHAIRMAN SERVIS: Are there any other remarks?

DR. BLUM: Just a few by way of reminiscence. This is a sort of historical meeting, anyway. I think one of the finest things, as pointed out by Mr. Meyer, is to take stock at intervals of what we know and of what we do not know. With all due respect, we find that the latter overweighs the former.

Take the subject of brass plating in particular, and everything that has been said and emphasized. How little we know the reasons. I will not attempt to give the reason for the effect of ammonia, but simply call attention to the fact that in most plating, one of the determining factors in the current density and the character of deposit is the precipitation of basic materials. Therefore, if you have any material in there such as ammonia, which will tend to keep all the products in solution, you will have a wider range of conditions.

Going back a little bit historically, someone reminded me of the fact that in 1913, I believe, the same year this Society was formed, the Electrochemical Society had a symposium on electroplating, in which they brought together information in the literature on electroplating. Each one of those papers had a valuable purpose. These papers, which are still of considerable interest, were published on the different kinds of plating.

Now, in this meeting twenty-five years later, we are getting back to these different kinds of plating, and this Society is to be congratulated for bringing these together. I am going to refer again to the Electrochemical Society. The electrodeposition division, of which Professor E. M. Baker is Chairman, has proposed, among other things, that a committee bring together, list and tabulate some of the problems for research in electroplating. Professor Baker has imposed on me the chairmanship of that committee. All that I will have to do is to read each one of the papers on this program and list three or four problems in electroplating. So we need not worry about the electrochemist or the Electroplaters' Society or the Bureau of Standards running out of work for quite a while to come.

Cathode Efficiency of Electroplating Barrels *and its Effect on the* Adhesion *of* Nickel Deposits

BY ALBERT HIRSCH

Electroplater and chemist, Snyder Inc., Mfr. of Automotive and Radio Specialties, Philadelphia, Pa.

Read at New York Convention, 1938

THE adhesion of nickel electrodeposits, obtained by the use of plating barrels, is dependent upon, (a) the efficiency of the electroplating barrel, and (b) the effective cathode current density. There is a minimum current density below which there is little or no adhesion of the deposit. A ball-burnisher, with 900 lbs. of 7/32″ steel diagonals, has been used to test the adhesion of the nickel deposits. An increase in the cathode efficiency of the electroplating barrels, from about 30% to 99%, was obtained by mechanical changes in the construction of the barrels.

HISTORICAL

As long as the production of nickel-plated work remained low, the pieces were attached to racks and, plated in still tanks. This method makes the cost of production relatively high, because of the hand labor involved and the cost of the racks used. A demand for an increase of 100% in production, and a limited floor space, made mechanical electroplating imperative, and electroplating barrels were adopted.

Finally a demand for electroplating to meet specifications, and the lack of information on the efficiency of plating barrels, made the determination of such efficiencies necessary, in order that reasonable control over the thickness of the deposit could be obtained.

So far as is known, previous to 1934 most electroplating barrels were of low efficiency and it is doubtful whether much thought had been given to the measurement of the cathode efficiencies of such equipment.

In 1935 the writer found it necessary to determine and improve the cathode efficiencies of plating barrels he was then using. In the improvement of the cathode efficiency he was assisted by three different manufacturers of electroplating equipment who cooperated by modifying their standard barrels, or constructing special barrels, as requested.

ADHESION

Many and various causes have been advanced for the "shelling" or "peeling" of nickel electrodeposits, among them being:

(1) failure to remove an oxide film from the basis metal during the cleaning or pickling processes, or the formation of another film on the work during the cleaning or pickling operation; in short, poor cleaning of the metal surface to be electroplated.

(2) variation of the pH and temperature of the electroplating solution.

(3) impurities in the solution.

(4) changes in the composition of the electrolyte during use.

(5) variation in current density during plating.

Of these variables, lack of adequate "effective" c.d. at the cathode was found to be most important. Even though the work was satisfactorily cleaned, and a satisfactory nickel-plating solution was used, relatively non-adherent deposits were obtained unless an adequate effective current density could be maintained on the cathode.

EXPERIMENTAL

In this work the electroplating department was used as a laboratory, and all equipment for the experiments was new, including a new motor generator set (1000 amperes, 12 volts). The electroplating barrels used were designated as A, B, C, D and E, and with the exception of Barrel (E), all the tanks had lead linings.

Electrolytes were freshly prepared for each barrel, to insure the least amount of impurities in each bath, and were all electrolysed for 4 hours prior to use in this work to insure good anode corrosion during these experiments. Runs were made over periods of six weeks with each unit. The cathode efficiency of each individual load run in the different units was determined by a modification of a method previously reported (See Hirsch,

MONTHLY REVIEW, American Electroplaters' Soc., **22**, No. 2, 7, Feb. 1935). The solutions used were made up to have the following composition, checked by analysis:

Substance	*g/l*	*oz./gal.*
$NiSO_4.7\ H_2O$	270	36.18
$NiCl_2 6\ H_2O$	24.7	3.31
H_3BO_3	30	4

The pH of these solutions was 6.5 (determined potentiometrically) and they were employed at a temperature of 120°F. (49° C) maintained by means of steam heat.

The curved type nickel anodes, 99% plus purity, depolarized and deskinned, were used. The cathode material consisted of fabricated cold rolled steel parts, each load contained 2538 of the pieces, each of area 3.25 in^2, giving a total cathode area of 57.26 ft^2 (532dm^2) /load. All loads were electroplated in a cyanide copper solution before nickel plating. A ball-burnisher (16″ x 30″ diam., 27 r.p.m.) containing 900 lbs. of 7/32″ steel diagonals, was used to test the adhesion of the nickel deposit. In this test, deposits of poor adhesion would "shell" off the basis metal immediately when the burnishing started, while good deposits could be burnished indefinitely without "shelling" of the deposit.

Barrel (*A*).

This barrel was an immersed type unit, being a double live-end, horizontal (14″ x 30″), hexagonal cylinder, with dangler cathode contacts; its cathode efficiency was found to be 30.6%. The maximum recorded current at full load was 150 amperes, using 12 volts, at 120°F. (49°C.). The determined effective c.d. was 1 ampere/ft^2 (9.3 amperes/dm^2).

Under the conditions used with this unit, no satisfactory loads were obtained, that is to say, in every instance the nickel deposit showed a tendency to peel. The tendency of these deposits to peel, it is concluded, was due to insufficient effective amperage on the cathode. The construction of this unit was such that there were four points of contact with the cathode, one contact from each dangler, provided all four danglers were always engaged in distributing current to the cathode, and there is no assurance that such was the case. As is characteristic of a

dangler type unit, the contacts were loose, resembling a "make and break" contact, and hence the current flowing through the cathode parts was not constant. This resulted in an insufficient effective amperage on the cathode, this causing a "shelly" deposit.

In an attempt to improve this unit a rubber coated rack was built, the purpose of the rack being to move the anodes closer to the cylinder. This, however, did not result in any improvement.

Barrel (B).

This consisted of a double live-end, horizontal (12" x 30"), immersed type hexagonal cylinder, with two danglers and, therefore, two points of contact with the cathode. The ammeter and voltmeter readings were respectively, 180 amperes, 12 volts and the temperature 120°F. (49°C.) at full load. The cathode efficiency was found to be 90%. In spite of this high efficiency, the nickel plated parts from this load did not withstand ball-burnishing.

The non-adherence of the deposit was, at first, attributed to the loose contact of the danglers, so these were made rigid and their diameters increased to allow more current to flow, if possible, to the cathode. This alteration did not bring about any improvement in the adhesion of the deposit or in the cathode efficiency. This absence of improvement led to the thought that the "shelly" deposit was due to the absence of sufficient points of contact on the cathode surface.

The manufacturers of this barrel very kindly revised the whole dangler system of this Barrel (B), so as to give 36 points capable of contact with the cathode. The construction was such that 18 of the points were always engaged in distributing current to the cathode. This unit, with its reconstructed spider-like cathode contact points, gave a cathode efficiency of 85% (a decrease of 5%).

The recorded amperes at full load remained the same as reported above, and the calculated C.D. was 2.64 amp./ft.^{2} or 0.285 amp./dm^2. By calculation, based on the total weight of nickel deposited and the known cathode area, the thickness of the deposit was found to be 0.000276 inches (0.0070 m m). The

adhesion of the deposit was very good and withstood the ball-burnishing test.

Barrel (C).

This unit was a single live-end, horizontal (14″ x 30″), hexagonal immersed type unit with 36 button contacts, 18 of which were always under the load, supplying current to the cathode parts. This barrel was found to give a cathode efficiency of 38.5%.

The volts and amperes, as read from the instruments, were 280 amperes and 12 volts, while the temperature was 120°F. (49°C.) and the plating time 4 hours.

The effective C. D. was calculated to be 2.16 amp./ft^2 or 0.233 amp./dm^2. The approximate thickness of deposit was computed to be 0.000456 inches (0.0116 m m.).

The nickel deposit from this barrel was adherent and could be ball-burnished indefinitely without peeling.

Barrel (D).

This was a specially built, horizontal, double live-end, immersed type, (14″ x 30″) hexagonal cylinder with 36 cone shaped button contacts, 18 of which continually supplied current to the cathode. This barrel was, further, a modification of barrel (C) and gave a cathode efficiency of 74%, almost double that of barrel (C).

The recorded amperes and volts at full load were, 260 amperes, 12 volts, with the temperature 120°F. (49°C.) and time of run 4 hours. The calculated effective C. D. was 3.64 amp./ft.^{2} (0.393 amp./dm^2). The calculated thickness of deposit was 0.00076 inches (0.0193 m m). As would be expected from the increased cathode efficiency and high effective amperage at the cathode, this unit gave a very satisfactory deposit of nickel.

Barrel (E).

In order to observe whether the insulating qualities of rubber would cause any improvement in cathode efficiency over that given by a barrel having a lead tank lining, Barrel (E) was specially built with a rubber tank lining. This rubber tank lining was the only difference between Barrel (E) and Barrel (D). As stated previously, all the other barrels had lead tank linings.

The plating conditions were as follows: current 200 amperes at 12 volts, temperature of solution 120°F. (49°C.), time of plating 4 hours. The effective C. D. was calculated to be 3.45 amp./ft^2 (0.373 amp./dm^2) and the thickness of the deposit

0.00073 inches (0.0185 m m). The cathode efficiency was found to be 98.5%.

This 98.5% cathode efficiency given by Barrel (E) was an increase of 24.5% over that given by Barrel (D). This means that not only was a saving in the time for the same thickness of deposit brought about, but also a saving in plating power was effected by this change from a lead to a rubber tank lining.

Test runs were made in Barrel (E) to ascertain the effect of change in pH upon the peeling of the deposited nickel. The pH was varied over the range 5.0 to 7.6 without any peeling of the deposit occurring. Deposits obtained when the pH was below 5.0 peeled when ball-burnished. A pH between 6.4 and 6.8 gave the most adherent deposits.

The effect of length of time of plating and, therefore, of thickness of deposit was also investigated. The plating time was varied from one half hour to four hours per load without any noticeable effect upon the peeling of the deposit.

Increase or decrease in the size of the load also was without effect on the peeling of the deposit during ball-burnishing.

SUMMARY

In the work described above analytical, electrical and temperature control were maintained.

It was found impossible to obtain adherent nickel deposits from barrels having loose or moving cathode contacts.

Ineffective current distribution to the cathode parts is sometimes due to poor contacts between the cathode parts, caused by the shape of the parts and by "nesting", and causes peeling of the deposit while ball-burnishing.

Nickel deposits from barrels, under conditions, where the cathode efficiency is less than 31.5 % or where the effective C. D. is less than 1 ampere/ft^2, were found to be non-adherent and incapable of withstanding the ball-burnishing operation without peeling.

Ammeter readings, in barrel-plating, can not be used to compute the absolute thickness of the deposit unless the cathode efficiency of the barrel has been previously determined.

There are, doubtless, many causes for peeling or blistering of nickel deposits; but the cause of the prevalence of peeling in any particular instance is a matter for separate investigation.

Business and Social News

BRANCH NEWS

Educational Activities

AMERICAN ELECTRO-PLATERS' SOCIETY

NEWARK BRANCH

The regular meeting of the Newark Branch, A.E.S., was held on Friday evening February 4th at the Hotel Douglas. The meeting was called to order at 8:15 p.m. with the following officers present: George Klink, President; George Wagner, Secretary; Nelson Sievering, Treasurer; Paul Oldam, Librarian; Samuel Taylor, Samuel Glickenhaus and Thomas Haddow, Trustees.

The minutes of the previous meeting were read and approved.

A communication from Mr. R. M. Goodsell, General Chairman of the Milwaukee Convention, was read and discussed. Mr. Robert Raymond Sizelove and Mr. Paul Oldam were appointed as a committee for the purpose of abstracting articles for the REVIEW, complying with Mr. Goodsell's request.

An invoice for third quarter per capita tax was presented and ordered to be paid.

An application for Mr. William T. Maguire to associate membership was voted to take the regular course.

Mr. Paul Oldam urged the members to prepare exhibits for the Milwaukee Convention.

Mr. Horace Smith and Mr. George Wagner reported that they had investigated rooms at the Newark Athletic Club and the Robert Treat Hotel but found them no more suitable than the room we now occupy at the Hotel Douglas and it was decided that the Club Room of the Hotel Douglas would be our future meeting room.

Our speaker for the evening was Mr Robert Raymond Sizelove, Research Chemist of the Frederick Gumm Chemical Co. His subject was "Rapid Accurate Plating Solution Control", which proved very interesting. Many members asked for a copy of the analysis. Mr. Sizelove was asked permission to have his paper published in the MONTHLY REVIEW. This request he gladly granted.

Mr. Harmon S. Hunt related some of his experience with "Wetting Agents" in Nickel Solutions. He stated that he and Mr. Dunroe are working on a paper to be presented at the Milwaukee Convention.

Meeting adjourned at 11:00 p.m.

GEORGE WAGNER, *Sec.*

WATERBURY BRANCH

Minutes of Meeting, February 11, 1938:

Mr. E. Vincent Davis of E. I. DuPont de Nemours & Co. gave a talk on the color photography used in conjunction with outdoor exposure tests. He showed several slides which illustrated the appearance of the various plated samples after they had been exposed for six months or longer. By the use of color photography it was possible to visualize the effects of exposure better than by reading a report and description of the appearance of the samples.

The meeting was attended by thirty-six members and guests and was considered to be an unusually successful meeting.

Mr. Edward J. Nolde was elected to active membership in the Branch.

The next meeting will be held March 11th and the speaker at that time will be Mr. George Dubpernell who will demonstrate how the physical properties of various elements can be anticipated from the periodic system and how the ability of various elements to be plated can be predicted from the same table. This is an unusual way of laying out the periodic table and it is believed that the paper should be interesting.

E. T. CANDEE, *Sec.*

LOS ANGELES BRANCH

Minutes of the Los Angeles Branch of the A.E.S. held February 9, 1938 at the Rosslyn Hotel:

President John L. Merigold called the meeting to order.

Minutes and financial report of the previous meeting were read and accepted.

Bills including per capita tax were read and ordered paid.

Don Bedwell introduced Mr. G. F. Rucker of the Leeds & Northrup Co., of Philadelphia, who demonstrated the latest type electrical pH Indicator.

Mr. E. Lamoureux listed the speakers he is trying to obtain for the Los Angeles Branch West Coast Platers convention to be held at the Roosevelt Hotel in Hollywood, March 26, 1938.

The rest of the evening was spent in discussions and plans to make this affair one of the outstanding events of our Society on the Pacific Coast.

Meeting adjourned at eleven-thirty P.M.

RAYMOND SOLIVAN, *Sec.-Treas.*

MILWAUKEE BRANCH

On Feb. 10, 1938, the Milwaukee Branch of the A.E.S. held its usual monthly meeting. We had no special speaker this month and it is very apparent that it is necessary to have something of general interest or the boys are absent. This month's meeting was given over to a general discussion of the progress of the National Convention Committee. President Ray Goodsell is well pleased with the work of the men who have undertaken this work and we must report that everything is shaping up very well. The all-important speaker program is well organized. Most of the papers are by practical men, and should thus be well understood by all members of the A.E.S.

A letter from Vice-President Ray Goodsell was read urging that now is the time for the various branches to appoint able and willing men to the "Abstract Section" of the REVIEW so that as soon as possible the new Vice

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President will have some definite men to rely upon for this important work.

The Milwaukee Branch has decided to use the Republican Hotel for its future meetings, starting in April.

Robert Steuernagel, Jr., son of the well known Bob, was elected into active membership. This is the fifth time that both father and son have been members of our Branch. The other four occasions were as follows: John Miszewski, and John, Jr.; Jack Geissman, and son Wm. C.; Henry Binder and son Roman; the late Pat Sheehan and sons Vincent and Edw. T. We believe this is a record and shows the sons are following their fathers' life work.

On Lincoln's Birthday the Milwaukee Branch held a party for members and wives at the Schroeder Hotel, which was attended by 35 couples. To say the least, every one had an excellent time. There was dancing for entertainment, buffet lunch to help us carry on, and refreshments to keep things humming. There was distinctly a feeling of the famous Milwaukee "gemulichkeit" present all evening. Many of the members talked of having such affairs more frequently. After all, this party was the first for a good many years in which the other half of the members were present.

Mrs. Jack Geissman was chosen chairman for the ladies' committee for the 1938 Convention and she has 12 able assistants. More about the latter later.

A. J. HERMANSEN, *Sec.*

CHICAGO BRANCH

The regular monthly meeting of Chicago Branch was held Saturday, February 12, at the Atlantic Hotel.

President E. Stepka presided and all other officers were present.

The applications of Mr. H. L. Decker and Mr. R. S. Modjeska were read and committees appointed on same.

Mr. H. E. DeGreiner was elected to active membership.

Mr. H. Faint was reinstated.

A letter from Mr. Goodsell, chairman of the Educational Committee regarding members to abstract for our MONTHLY REVIEW was read and placed on file; also a letter from Mr. W. C. Geissman regarding a Branch paper was read and placed on file.

The report of our 26th Annual Educational meeting and Banquet was read and approved, and the committees discharged, with a vote of thanks for furnishing one of the finest meetings ever held by Chicago Branch.

Mr. J. Mintz reported that Tom Kennedy was again on the sick list. Chicago Branch members extend their best wishes to Mr. Kennedy and hope he will soon be back to normal health.

Mr. Longfield asked that members planning to have an exhibit of their work at the Milwaukee Convention please get in touch with him, as Chicago Branch should be well represented. Get into the spirit of the A.E.S.; this is your society and stop waiting for the other fellow to do it all. "Let's Go."

A very interesting paper by Mr. Kettering was read by Mr. C. S. Tompkins.

The proposed revision of our constitution and by-laws were read and referred to a committee. The meeting adjourned at 10 p.m. after which refreshments were served to 90 that were present and a nice informal visit was enjoyed by all.

J. W. HANLON, *Sec.*

Questions and Answers of Feb. 4 Meeting Detroit Branch

Q. What is the better acid dip, muriatic or sulphuric, for the plating of steel, brass, and die cast metals?

A. In either case the function of the acid dip is to neutralize traces of alkali from the previous cleaning operation, and to activate the surface. Theoretically, there should be no preference. Practically, sulphuric is preferred because of its lower cost, and for the fact that it does not give off corrosive fumes which are the cause of much rusting on work in process and on equipment.

Q. Does anyone know the cause of the brown corrosion film on non-ferrous trunk hinges and ornamental medallions on some of the 1937 motor cars?

A. On brass parts, this is the well-known "St. Louis Browns," caused by an insufficient thickness of nickel under the chrome. On die cast parts, it would indicate also a deficiency of copper, as well as nickel.

Q. What might cause an acid copper bath to stop working?

A. Too high a concentration of copper sulphate. When the bath cools, the excess sulphate crystallizes on the anodes and insulates them.

Q. Is the anodizing process on aluminum too expensive for pocket flashlights?

A. This finish is more costly than those now commonly used on flashlights.

Q. What is the best method of preparing aluminum for anodizing?

A. Any alkaline cleaner which is buffered to prevent attack of the metal.

BOSTON BRANCH

Boston Branch met Thursday, the 17th, at the Bradford Hotel, with President Mintie in the chair.

Minutes of the previous meeting read and approved, communications read and placed on file, bills read and moved they be paid.

A report on the questionnaire sent to the members was read and will be taken up after the banquet, some of them were read by Bill Treadwell.

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Joe Barron made a report for the banquet committee and says that everything is set for the best banquet the Branch has ever held. We have one of the finest programs ever seen; the floor show will be better than last year and there will be room for 1500 people.

Bert Sage made a report on the educational session and he says that it will be the best in years and hopes that every member will attend.

The text for the proposed changes in the constitution and by-laws and the rewriting of the amendment of Boston Branch will be taken up at a later meeting.

After the regular order of business the chair was turned over to the librarian, Bert Sage. He had two speakers for the evening, William Simonetti of our Branch, who spoke first. He gave a very interesting talk on how he does the finishes in his line of work; he had about fifty samples with him, all different finishes of the novelty ware. He explained how he does them and gave the solutions for each finish. He had gold, silver, nickel, and brass finishes. He answered all questions for the members. We had

three members of Providence Branch with us and they enjoyed the talk very much.

Our next speaker was Harry J. Lack, another member of the Branch. He also spoke on the same finishes that Bill Simonetti spoke on, giving an outline of these finishes as he did them years ago. He also has some sample finishes with him that he did years ago and some were as good today as the day he did them. He had so many questions put to him that it was impossible to get them so that he will give his talk again at a later date. Both speakers were given a rising vote of thanks for their talks.

The paper by Bill Simonetti will be in the REVIEW as soon as we can get it written up.

Meeting adjourned at 10:30 p.m.

A. W. GARRETT, *Sec.*

HARTFORD BRANCH

The Hartford Branch of the A.E.S. held its regular monthly meeting on Monday evening, Feb. 14, 1938, at the Elk's Club, Bristol, Conn.

The meeting was called to order at 8:15 p.m., with President Pietro in the chair. Minutes of the previous meeting were read and accepted. All communications were read and placed on file. A bill for our third quarter per capita tax amounting to twenty-one dollars ($21.00) was voted paid. One applicant was elected to associate membership. It was voted to abandon the idea of a Hartford Branch Educational Session and Banquet this spring, due to the general business recession.

In reply to Mr. Goodsell's request for members to offer their services to help abstract articles for the REVIEW, the Hartford Branch has been fortunate in securing the services of Mr. N. Promisel of the International Silver Co., of Meriden, Conn., who has kindly offered to serve in this capacity.

The balance of the evening was spent in shaping together some of the details of the Branch paper to be given at the 1938 Convention. This work is in Mr. Promisel's care.

The meeting was attended by 22 members and was adjourned at 11:15 p.m.

E. V. GRANT, *Sec.*

NEWARK BRANCH

The regular meeting of the Newark Branch, A.E.S. was held on Friday evening, February 18, 1938, at the Hotel Douglas.

The minutes of the previous meeting were read and approved.

A communication from the Boston Branch, announcing their Annual Educational Session and Banquet was read and some of the members promised to attend this affair.

Mr. George Wagner, Chairman of the Banquet Committee, reported progress for the Educational Session and Banquet to be held on April 23, 1938, at the Hotel Douglas.

Mr. MacStoker and Mr. Ligouri who attended this meeting with a few more of the New York Branch members, were called on for a few remarks. They both commended Newark Branch on its new meeting quarters .

Mr. Strausser from the Bureau of Standards was also called upon for some remarks.

Mr. Floyd F. Oplinger of R & H Chemical Division of E. I. DuPont Co., was presented next as the guest speaker of the evening. His subject was "The Disposal of Waste Cyanide Solutions in Industry." His recommendations, "Disposing of Cyanide Solutions" by Michigan Engineering Experimental Station Bulletin No. 152 by E. F. Eldridge. Mr. Oplinger

pointed out that Cyanide Solutions dumped into the sewers are very harmful to rivers and lakes, inasmuch as they kill the fish and pollute the waters. The State of Pennsylvania and some of the other States have a law against dumping of acids, alkalies and colored matter into sewers or holes dug in the ground. These laws were brought about by some farmers having their cows killed by drinking water from the rivers which were poisoned by Cyanide, caused by some factory dumping its Cyanide Solutions into the sewer, which automatically emptied into the river. The most practical way of disposing of old Cyanide Solutions is by boiling them in large tanks equipped with a hood and a stack high enough to carry the fumes away. In this manner, in a 1000 gallon tank Cyanide can be decomposed at the rate of 1½ to 2 ounces per gallon, per hour at a temperature of 176° F. A concentrated solution decomposes more rapidly than a dilute solution.

Mr. Oplinger was given a rising vote of thanks by the 68 members and visitors present.

We were then entertained by one of the world's greatest magicians, Mr. Morrow of the Egyptian Lacquer Co., who held the members in a uproar for at least an hour.

Meeting adjourned at 11:00 p.m., and was followed by refreshments.

GEORGE WAGNER, *Sec.*

BINGHAMTON-ELMIRA BRANCH

The February meeting of the Binghamton-Elmira Branch was held at the Y. M. C. A. in Binghamton. Thirty-five members and friends attended to hear Mr. B. Dow of LaSalco, Inc., St. Louis, Mo., deliver an interesting talk on "The Fundamentals of Barrel Plating," with actual demonstrations.

Mr. Dow's subject prepared the way for an hour and a half of questions which made this meeting one of the best from a discussion standpoint.

Binghamton-Elmira Branch wishes to thank Mr. Dow and LaSalco for the fine presentation.

AUSTIN FLETCHER, *Sec.*

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GRAND RAPIDS BRANCH

The Grand Rapids Branch of the American Electroplaters' Society had a good attendance at its regular February meeting.

Several communications were read and acted upon. Chairmen were appointed to two committees: Milwaukee Exhibits Committee Chairman, Peter H. Vlug; Membership Committee Chairman, John B. Hawley.

Men were found who were willing to do abstracting for the MONTHLY REVIEW in the 1938-9 season.

Our new member William J. Van Dyke was voted into the Branch. Mr. Van Dyke is with the Hart and Cooley Co., Grand Haven, Michigan. Also one member was transferred from the Detroit Branch to Grand Rapids. He is Lyman B. Speary with the G. R. Metalcraft Co.

Our Librarian, Mr. Homer Morton talked on the various uses of old cyanide solutions in the plating room.

A discussion followed concerning meeting attendance. One of the members stated that he didn't see why the branches should have to "put on a show" in order to hold interest and keep up attendance. Of course that is a good point but on the other hand no one wants to come to a meeting to look at four walls and listen to a few half-cocked discussions, especially if they travel 40 or 50 miles in cold weather as some of our members do. It was decided to do everything possible to make our meetings more interesting.

A program of one or two papers to be read at each meeting will be put over and the members will be reminded in their meeting notice by mail that they should bring two or three questions to put in the blind question box at the beginning of each session. A party for members and friends will be put on in April by the Branch.

When the meeting adjourned, all members seemed more enthusiastic than they had been for some time.

CHAS. S. WHALLEY, *Sec.*

ROCHESTER BRANCH

The Rochester Branch held its regular monthly meeting on Friday night, February 18. In the absence of President Kohlmeier, vice-president Hehr took the chair. Minutes of previous meeting read and approved as read. Communications read and acted upon. All bills ordered paid. The application of Mr. Floyd M. Erlenmeyer, 253 Alexander St., Rochester, N. Y., for admittance as an associate member was read and ordered published. Mr. Francis P. Dougherty, 62 Russell St., Rochester, N. Y., and Mr. Charles P. Wake, 319 Ellicott St., Rochester, N. Y., were elected as active members.

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After a short discussion of the suggested changes to the present constitution the meeting was adjourned.

JUDSON R. ELSTER, *Sec.*

CLEVELAND BRANCH

The regular monthly meeting of the Cleveland Branch of the A. E. S. was held Saturday, February 5, 1938, at Hotel Cleveland.

Meeting was called to order by Vice-President Fred Motts.

Mr. E. C. Friedl of E. I. Du Pont Co., applied for membership.

Mr. Bernard Case of Detroit Metal Products Co. of Cleveland, elected active member of Cleveland Branch.

Mr. Geo. Hogaboom gave a fine talk on pH of Alkaline Plating Solutions.

The Cleveland Branch wants to thank Mr. Geo. Hogaboom again for his talk; it really opened the boys' eyes.

The dinner-dance of our Branch was held Saturday, February 12, at Hotel Cleveland. Everybody had a very good time. We wish we could have a party like that more often. The members really meet one another more than they do at a meeting. There were just enough refreshments to make it a good party. CHARLES F. OTT, *Sec.-Treas.*

BOSTON BRANCH

Boston Branch met Thursday the 3rd at the Bradford Hotel with President Mintie in the chair.

Minutes of the previous meeting read and approved, communications read and placed on file, bills read and moved that they be paid.

One application was read for the first time and turned over to the Board of Managers: Edward E. Whitney, 104 Gold Street, Worcester, Mass., active.

The transfer of Donald Wood to Providence Branch was granted. Boston Branch will miss Don for the good work he has done for Boston Branch; good luck to you, Don.

The report of the banquet committee was made but a final report will be made at the next meeting. It was a success.

A motion was made that the Branch hold its annual Chowder Party in April the date to be fixed before the next meeting. This is to be held at the Squantum Yacht Club, Quincy, Mass. The chowder will be made by our president, Arthur Mintie. A small charge of fifty cents will be made to cover expenses. All are welcome.

There being no further business the chair was turned over to the librarian Bert Sage. He had as the speaker, William Newberry of the Detroit Rex Products Co. His talk was "Solvent Degreasing with Moving Pictures." He read a paper before showing the pictures explaining how the work is done, how the machine is set up and the different solvents used. Then he showed the pictures of the machines in use showing the work passing into the machine and coming out. It was a very fine demonstration. He answered all questions for the members. He was given a rising vote of thanks for his very fine talk.

The meeting adjourned at 10:30 p.m.

A. W. GARRETT, *Sec.*

BUFFALO BRANCH

Buffalo Branch held its regular monthly meeting at the Stratford Arms Hotel, Monday, February 22, 1938. The meeting was called to order by our president, Mr. Ruff.

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Minutes of the previous meeting were read and approved. Communications read and acted upon.

At this time Mr. Ruff introduced Dr. C. J. Wernlund of the Chemical Division of E. I. Du Pont de Nemours & Co., whose paper on Modern Trends in Electroplating was very interesting and was followed by many questions.

Meeting adjourned at 11 p.m.

WILLIAM HART, *Sec.-Treas.*

NEW YORK BRANCH

The New York Branch held two meetings during the month of February at their headquarters in the Hotel Pennsylvania.

The first meeting on Friday, Februrary 11th, was an Educational Session at which a double feature presentation on the relative subjects of the pH of Electro-Plating Solutions and the pH of Alkaline Plating Solutions was given by G. Byron Hogaboom Jr., and George B. Hogaboom, Sr. This meeting was very well attended, there being one hundred and five present for the occasion. Their subjects were well presented and held a high interest from those present. The after discussions took up considerable time and debate. A number of slides were shown to present facts and figures in connection with the subjects. The officers of the Branch expressed their appreciation to the speakers for their efforts and the members and visitors extended a rising vote of thanks on their part.

The second meeting of Friday, February 25th, was a business meeting at which Branch matters and the proposed revision of the Constitution were taken up and discussed as per request of President Wilson and the Revision Committee. Further consideration will be had at subsequent meetings. The Question Box was opened and several problems were gone over in detail.

The Branch elected two applicants to membership and received one new application for same.

F. J. MACSTOKER, *Sec.*

MONTREAL BRANCH

The regular meeting of Montreal Branch was held on Feb. 24. Plans were laid for a special meeting to which will be invited the new prospective members, the Branch feeling that a special program is necessary to impress those who consider joining the A.E.S.

Mr. E. Creighton read a most excellent paper on the new rectifiers now being manufactured by his company.

Applications for membership were received from Thomas Arthur Willis, of Willis Steel Co., of Canada, Ltd., and Mr. H. S. Jordon, Canadian Marconi Co.

Mr. Charles Douglas, remembered by Philadelphia and New York Branches, occupied the chair.

J. T. CRONIN, *Sec.*

TOLEDO BRANCH

A meeting of the Toledo Branch was held Feb. 3rd, at the country home of Mr. Spanolis with 24 members and visitors present. The meeting was

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Wilfred S. McKeon, President.

called to order by President Moore. The minutes of the last meeting were read and approved. A bill for the 3rd quarter per capita tax was ordered paid.

Mr. James Nagle, chairman of the Exhibits Committee, reported that to date he had received quite a number of promises for exhibits of plated parts for the Convention. A communication from our first Vice-President, Mr. Goodsell was read, requesting the name of one of our members who would give some time to abstract work for the REVIEW. Mr. W. Hunlock agreed to act in this capacity. Petitions for membership of Mr. Perrin J. Simes. Box 426, R. R. No. 10, Toledo, Ohio and Walter F. Wiktorowski, 3342 Franklin Ave., Toledo, Ohio, were presented and favorably acted upon. There being no further business the meeting was adjourned.

For the next hour we were entertained by representatives of the Chevrolet Motor Co., with some very interesting and educational sound pictures.

A vote of thanks was given to Mr. Mike Spanolis and Mr. James Nagle, Jr., for supplying the "near banquet" for the evening. Mr. Spanolis furnished the food on the occasion of his 45th birthday, and Mr. Nagle the beer in honor of a set of twins presented to him by his wife on the previous day. It is very gratifying to the officers of this Branch to see such good attendance at our meetings. We hope it continues through the spring and summer months.

W. WEIKER, *Sec.*

PROVIDENCE-ATTLEBORO BRANCH

The Providence-Attleboro Branch held its regular meeting at Narragansett Hotel, Room No. 3, on Monday, Feb. 21, 1938. Mr. Floyd Oplinger was the speaker and he gave us a very good talk on "Disposal of Waste Cyanide Solutions in Industry."

Mr. Wm. J. R. Kennedy was present and, following Mr. Oplinger, spoke for a few minutes on "What to do for the good of the Branch."

Mr. Barry, an instructor at the R. I. School of Design, was introduced and he briefly outlined the plans of the school, along the lines of electroplating, showing that the management is alive to the need, in this section, for

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proper scientific education, for the future platers and colorers.

Mr. Bert Sage was also present, and spoke about the coming banquet at Boston, to which he invited us.

There were 32 present.

We received 4 applications for associate membership.

We adjourned about 11 o'clock.

JOHN ANDREWS, *Sec.*

PHILADELPHIA BRANCH

Meeting called to order by President J. E. Underwood, on March 9, 1938. Mr. E. Zurback, Jr., Acting Librarian, introduced the speaker Mr. Al. Hirsch who gave a very interesting talk on the Rochelle Salt action in Cyanide Copper Plating Bath, which was illustrated by slides. After a brief discussion, Mr. Hirsch showed some very old and interesting views of old Philadelphia. Mr. Al. Hirsch was given a rising vote of thanks.

Minutes of previous meeting read and approved as read.

A communication from Milwaukee Branch Convention Committee was read. It was moved and seconded the Branch paper title should be "Paper from Philadelphia Branch." Carried.

A communication from Supreme Vice-president R. M. Goodsell was read and accepted. A communication from Leipzig Trade Fair Inc. was received — moved and seconded that this be received and filed. Carried.

Communication was received from Executive Secretary as to the proposed new Constitution and By-Laws. President J. E. Underwood informed the Branch that officers had held a meeting and discussed the proposed changes.

After a thirty-minute discussion, it was moved and seconded that the Secretary secure and mail a copy of the proposed new Constitution and By-Laws to the Branch members and the Editor of the *Quaker City Reminder*; also to include the proposed revised paragraphs as the officers presented them at this meeting.

Banquet Committee Chairman Nat. Verrelle reported the Yearly Meeting and Banquet both a financial and educational success.

Al. Hirsch, Research Committee members, reported progress.

There being no further business, the meeting adjourned until Friday, March 18, 1938, at 8:00 p.m.

ROBERT E. JACKSON, JR., *Sec.*

DETROIT BRANCH

The regular meeting of American Electro-Platers' Society of Detroit Branch was held in Hotel Statler, Friday evening, March 4th, with Mr. A. B. Wilson presiding. There was a very good attendance.

The following applications were received for membership: A. Lowell Scafuri, 15493 Mendota, Dertoit, Mich. Active; Francis John Newton, 2994 Gladstone, Detroit, Mich., Active; George E. Lemke, 5200 W. Chicago, Apt. 410, Detroit, Mich., Associate; Dale Augsburger, 4-117 General Motors Building, Detroit, Mich., Associate. Also Mr. Leroy Camel was transferred from the Cleveland Branch. Mr. Camel's address is 18806 Gainsborough Road, Detroit, Mich., Active. Mr. Edward C. Hillier of 238 Hawkings, Sarnia, Ontario, Canada, an active member, was transferred from the Toronto Branch.

The speaker of the evening, Mr. George A. Spencer, president of the Crown Rheostat and Supply Company of Chicago, was then introduced by Mr. Wilson. He gave us quite a talk on the Cost of Making a Profit, which was enjoyed by all those present.

Mr. B. F. Lewis, our acting librarian,

then collected the question cards and took charge of answering these questions. There were quite a few questions and they caused a lot of discussion and the questions and answers will be published in the REVIEW.

Mr. Hoeffer, chairman of the committee who is getting up a paper to read at the Milwaukee Convention, then gave a report on the paper which is progressing and they expect to have it in shape so as to read it at our first meeting in June.

Mr. William Phillips, chairman of the Research Committee, then appointed the following to assist him in the Detroit area in soliciting funds for the coming year. They were: Geo. L. Nankervis, Jack Mayer, James Higgins, Mr. Cherry, Gus. Soderburg, Herbert W. Kennedy, Carl Heussner. I am sure with this Committee, Detroit should collect far more than their quota toward this fund.

It was decided that the proposed amendments to our Constitution be referred to the Board of Managers and they are to set a date at which time they are to be taken up and discussed at one of our regular meetings.

There being no further business, the meeting adjourned at 10:30 p.m.

T. C. EICHSTAEDT, *Sec.*

DETROIT BRANCH QUESTIONS and ANSWERS

Q. What method can be used to get rid of carbon smut on cold rolled steel without hand scrubbing?

A. The only substitute for hand scrubbing is the action of strong sprays of suitable cleaning solution. Since it is not possible to use a solution containing an emulsifier, due to excessive foaming, it is usually desirable to dip the steel in an emulsifying solvent first, and then spray with either water or an alkaline solution. In some cases the smut can be removed with hot muriatic acid after the grease is removed, but the fumes in this case are very undesirable.

Q. What lead plating solutions are best for general purposes?

A. The fluoborate and fluosilicate baths recommended in "Blum and Hogaboom".

Q. How can you eliminate trivalent chromium in a chrome plating bath?

A. Operate the bath continuously for several hours on dummy cathodes at low current density, preferably using "porous pot" diaphragm around the cathodes, and discard the solution from the diaphragms.

Q. What is the limiting concentration of tri-valent chrome before trouble develops?

A. Above 10 grams per liter.

Q. Is it advisable to put bags on anodes used in a copper cyanide plating bath?

A. It is best to use large bags enclosing several anodes, and to have a fairly open fabric so that the solution may circulate around the anodes.

Q. How may bright zinc be obtained without dissolving off half of the deposit in the bright dip?

A. If sufficient brightener is used in the bath, not over 10% of the deposit will be removed in bright dipping. It is also stated that at least one proprietary bath will plate bright without bright-dipping.

Q. Can small amounts of chromium be removed from copper cyanide bath, and if so, how?

A. So far as known, there is no way of salvaging a copper bath contaminated with chrome.

Q. What treatment should be given to stainless steel preparatory to successful plating?

A. A solution of nickel chloride plus muriatic acid is suggested as an ac

tivator; also Ferric Chloride plus arsenic. The initial coating should be nickel plated from a chloride bath at a pH of 2.0. Nickel-chromium-iron alloys are more difficult to activate than chromium-iron.

Q. What is the cause of the defective plating on a die cast door handle which has black streaks on the under side?

A. The plating bath evidently has a zinc content above .2 grams per liter. Also, no agitation was used. In order to plate successfully it would be necessary to increase the temperature and current density, and agitate the work. A moderately heavy copper undercoat would also help.

Q. How may files be sharpened by means of pickling?

A. Treat the files anodically in a sulphuric acid electrolyte similar to that used for nickel stripping; or by immersion in a pickle composed of 50% H_2SO_4 and 50% HCl.

WATERBURY BRANCH

The regular monthly meeting was held at the Hotel Elton, Friday Evening, March 11th. Twenty-one members were present.

Mr. George Dubpernell, a member of our own Branch, gave a talk on the Periodic Table and how properties of the different elements can be anticipated from study of this table. He rearranged the periodic table so that all metals which can be plated appeared in one group, also the metals which were easily plated were separated from those which were difficult to plate, and these again were separated from those which were almost impossible to plate. Many things were brought up about the relations of the different elements that were answered in the question period.

The subject of an exhibit for the National Convention was brought up and Mr. Lougee, Chairman of the Exhibit Committee, made a report on the work he has done and it was decided that the expense was greater than the exhibit warranted, so the Committee was discharged with thanks for the work done.

Mr. George Dubpernell, Chairman of the Paper Committee, has been working on the preparation of a paper for presentation at the Annual Convention. He gave a report on the work he had done and then asked to be relieved of further duties as Chairman of the Committee. Mr. George Muscio was appointed chairman of this committee with Mr. Dubpernell to work with him. It will be their function to edit a paper to be presented at the Milwaukee Convention.

E. T. CANDEE, *Sec.*

CHICAGO BRANCH

The regular monthly meeting of Chicago Branch was held March 12, 1938, at the Atlantic Hotel.

President E. Stepka presided and all other officers were present.

The application of Mr. L. E. Weeg was read and a committee appointed on same. Mr. R. S. Modjeska was elected to associate membership and Mr. H. L. Decker was elected to active membership.

Mr. Longfield, chairman of the exhibits for Chicago Branch, states he has secured promises for several fine exhibits for the coming convention at Milwaukee.

Mr. D. B. Stockton made a very interesting talk on Current Control in the plating baths.

Mr. O. E. Servis chairman of the picnic committee reported that Amblers Grove at Devon and Crawford Aves. had been secured for Saturday, August 20, to hold our annual picnic.

The following questions were found in the question box:

Q. What causes cyanide zinc solution to plate dull lead color after precipitating carbonates out with calcium sulphate?

A. There may have been some impurities in this solution such as copper or cadmium and this would cause dull deposits.

Q. What is the method for preparing stainless steel (18—8) *before chrome plating.*

A. Etch slightly with a nitric etch, or use a 5% hydrochloric acid solution with reverse current for a light etch.

Q. What happens when calcium sulphate is added to a Stannate Tin solution to remove carbonates?

A. This would probably precipitate out some of the Tin.

Q. A silver solution contains copper as an impurity; how can this copper be removed?

A. The best way is to work the copper out; a small amount of copper will not hurt the silver solution although it does make the deposit harder.

Q. A lot of Epsom salt was put in the nickel solution and now the nickel peels.

A. After a short discussion it was found that the Epsom salt was not at fault, but that the pH was off.

Q. What effect will ammonia chloride have on a steel tank when used in a brass solution?

A. Chloride used in solutions will attack a steel tank.

Q. What is the best pH of Rochelle copper solution, and how much free cyanide?

A. pH 12 free cyanide about ½ oz.

Q. A nickel solution contains 4 oz metal, 4 oz boric acid, 4 oz nickel chloride temperature 110°, *pH* 5.6; *work is steel. Are these quantities O.K. for this temperature?*

A. Yes.

J. W. HANLON, *Sec.*

MILWAUKEE BRANCH

Milwaukee Branch held its regular business and educational session on the 10th of March. We had a rather large group of men present and nearly all the officers also. The minutes of the last meeting were read and approved. No bills this month. Mr. Julian J. Maliszewski who has been with the Reliable Plating Works of Milwaukee for nine years made application for admission into our Branch.

Mr. Robert Steuernagle who has charge of getting the advertising for the Convention publication asked that each local member work to get more local "ads" in the magazine, by getting each employer interested to help make this Convention a success. We ask the boys to work hard.

The business of the evening was working on the revision of the Constitution and By-Laws of the Society. After about an hour's work reviewing the changes it was decided to appoint a committee of six men to thoroughly study this matter and these men will make a complete report and recommendations at the April meeting. The following members were appointed to this committee: Ed. Sheehan, Ir. Robinson, H. Bornitzke, Wm. C. Geissman, Frank Marx, and Ray Goodsell.

Mr. Henry Bornitzke would like to stress to each member that they get to work and prepare an exhibit for the Convention. Now is the time to begin to make a real worthwhile exhibit and try to win one of the awards. Ample preparations will be available to show these exhibits to good advantage. Let's have some real competition among the electro-platers; show the rest of the men what you can do.

A. J. HERMANSON, *Sec.*

BINGHAMTON-ELMIRA BRANCH

The March meeting of Binghamton-Elmira Branch was held at the Onondaga Hotel, Syracuse, New York, Friday evening, March 11. Dinner was served in the Roof Garden at 6:30 to about 50 members and friends.

The Binghamton-Elmira Branch held this meeting in Syracuse and the January meeting in Sherrill with the idea in mind of interesting the platers in the central part of New York State in the American Electro-Platers' Society.

The speaker of the evening, Mr. George Hogaboom of the Hanson-Van Winkle-Munning Co., spoke on the "pH of Alkaline Solutions." The subject was of great interest to all present as evidenced by the educational session lasting 2¾ hours.

While we did not have to carry George out, we certainly managed to tire him out, firing questions at him.

A. FLETCHER, *Sec.*

BRIDGEPORT BRANCH

The Bridgeport Branch held its regular monthly meeting in the Chamber of Commerce Rooms at the Stratfield Hotel on Friday evening, March 4. Joe Sterling called the meeting to order. There were twenty members present, among whom was our good friend Executive Secretary W. J. R. Kennedy.

The roll call of officers was read. The minutes of the last meeting were read and accepted. Reports of Sick Committee, none. Reports of Special Committee, none.

Banquet Committee: George Karl of the Hotel Committee reported that arrangements had been completed to hold a Banquet on April 30. Ray O'Connor, chairman of the Banquet Committee, reported progress, and turned a list of speakers over to the Publicity Committee.

A communication from Mr. Henry Bornitzke on exhibits at the National Convention, was read and turned over to George Wagstaff.

New Business: Mr. Kennedy brought with him copies of the By-Laws which were read by Mr. Meyer and explained by him and Mr. Kennedy. A discussion concerning these By-Laws will be held during the course of the April meeting.

A motion was made to adjourn at 10:30 p.m.

WILLIAM FLAHERTY, *Sec.*

DETROIT A.S.T.M. MEETING

The Detroit District Committee of the American Society for Testing Materials will hold its third annual meeting at the Detroit Leland Hotel, Tuesday Evening, April 19, with dinner at 6:30 p.m., and the technical meeting at 8:00.

Four 15 minute papers will be presented:

Corrosion Resistant Alloys — Dr. H. W. Gillett, Battelle Memorial Institute

Plating — Carl E. Heussner, Chrysler Corp.

Pretreating Metals — Ralph Wirshing, General Motors Corp.

Organic Coatings — J. L. McCloud, Ford Motor Co.

All those interested in the protection against corrosion of metals are invited to be present and take part in the discussions.

If you want to belong to the kind of a Branch
Of the A. E. S. that you like
You don't need to put your clothes in a grip
And start on a long, long hike.
For you will only find what you left behind —
There is nothing that's really new —
And you knock yourself when you knock your Branch,
For it isn't the Branch — it's YOU.

That a chain is as strong as its weakest link
Is a saying old but true.
So let's bolster up the weakest links
And start them out anew.
For you Committee men are part of the chain —
Come on men, do your stuff.
The officers need the help of each one —
Only the best is good enough.

Real Branches aren't made of men afraid
Lest somebody else get ahead;
For if everyone works and nobody shirks
You can raise any Branch from the dead.
So if, while you make your personal stake
Your brother can make his, too,
Our A. E. S. will be what we want to see
Let's try it, both I and YOU.

R. M. GOODSELL

BOSS OR LEADER—WHICH?

The boss drives his men; the leader coaches them . . . the boss depends upon authority; the leader on goodwill . . . the boss inspires fear; the leader inspires enthusiasm . . . the boss says *I*; the leader says *we* . . . the boss says *get here on time*; the leader gets there ahead of time . . . the boss fixes the blame for the breakdown; the leader fixes the breakdown . . . the boss knows how it is done; the leader shows how . . . the boss makes work a drudgery; the leader makes it a game . . . the boss says *go*; the leader says *let's go*.

(Contributed to B. C. Forbes' syndicated column by H. Gordon Selfridge, London department store owner.)

Here and There

BOSTON BRANCH BANQUET

The fourth Annual Educational Session and Banquet of Boston Branch was held on February 26, at the Hotel Bradford. The Educational Program was opened at 2 p.m. Mr. Bert Sage acted as Chairman and introduced Mr. Gustav Klinkenstein of Maas and Waldstein Company, Newark, N. J., whose subject was "New Items in Metal Finishing." The speaker gave some very fine suggestions on lacquer finishes, passing many samples around during his address and explaining the recent developments made in the lacquer industry towards more adhesive coatings in the finishing of metals.

Mr. Walter Meyer of General Electric Co., Bridgeport, chose as his subject, "A New Talk on Nickel." Mr. Meyer gave us an idea of the amount of nickel used in the U. S., and mentioned our dependence upon other countries, particularly Canada, for our source of supply. Many other interesting items were mentioned in his talk, at the close of which he was asked many questions on this and other subjects by his listeners.

Mr. Burt Daw of Lasalco Co., St. Louis, was the last speaker on the program, giving a practical demonstration of what actually happens in a plating barrel under various conditions. Mr. Daw showed the behaviour of the work placed in the cylinder which stood on the platform, starting with a small quantity in the barrel at 2 R.P.M. until the barrel was fully loaded, various speeds were demonstrated, a careful check being made as to amperage, solution temperature, etc. Much interest was manifested in the display given and the speaker was asked many questions during the demonstration.

There were approximately 150 at the Educational Session and nearly 400 at the Banquet.

The floor show was exceptionally good. There were seven events that will long be remembered. Wee Willie Dee from New York got a great hand for his sleight of hand performances.

Adrian O'Brien, Boston's great Irish tenor, was overwhelmed with applause as he sang "When Irish Eyes are Smiling," "Gold Mine in the Sky," "Did Your Mother Come from Ireland," and other favorites requested by the audience. The Whirlwind Skaters were wonderful. Their roller skating act is one of the fastest in the country and has to be seen to be appreciated.

All the officers of the Boston Branch were on the job. Arthur Mintie, the President, with his cheerful smile and hearty hand shake, turned the meeting over to Bert Sage. The latter always keeps things moving.

Another outstanding member of the Branch is Joe Barron. Joe worked hard to make the affair a success and he certainly succeeded.

On behalf of the ladies present, we take this opportunity of thanking the Ladies Reception Committee for entertaining the members of their own sex while the men were at the Educational Session or somewhere else. Miss Ann Baker and her committee did a swell job.

Boston's Annual is always a great gathering place for platers from out of town. The following branches had members present: New Haven, Waterbury, Providence, Bridgeport, Newark, Baltimore, Springfield, Binghamton, and St. Louis. New York Branch was represented by First Vice-President of the National Society, Franklyn J. MacStoker and Ralph Liguori, President of the Branch.

For the courtesy extended by the officers and members of Boston Branch, the quick and efficient service rendered during the Banquet, the fine musical selections by the orchestra, and all the other details which helped to make this event so successful, we extend to Boston Branch our sincere congratulations.

Bridgeport Branch held their regular business meeting on Friday Evening, March 4, with Mr. Walter Meyer presiding. There was a long discussion on the proposed Constitution and By-Laws. Definite action will be taken at the next business session of the Branch. Plans for the Annual Educational Session and Banquet were discussed. Full details will be found in this issue of the REVIEW.

Baltimore-Washington Branch meeting was our next objective after leaving Bridgeport at 1:15 a.m. Met Mr. T. F. Slattery at the station at 7:45 a.m. and discussed with him many important items concerning the A.E.S. Visited Dr. Blum at the Bureau. We saw some of the work being done at the Bureau and discussed present and future developments regarding Research and other pertinent matters with Dr. Blum before leaving.

The Branch meeting was held at the Bureau of Standards on Saturday night. Many matters relating to branch activities were discussed with Mr. F. Pierdon in the chair. There was some discussion on the proposed changes in the Constitution, but final action was deferred until the next meeting. T. F. Slattery read the entire copy.

George Gehling, Past President of the National Organization, was present and was warmly welcomed by the members of the Branch.

QUAKER CITY REMINDER
March, 1938

The Philadelphia Branch would seem to be coming into more national notice recently, among other things, this publication having had the signal honor to be briefly quoted in the March *Metal Industry* in their first editorial, which incidentally is also our premiere appearance in those pages for all time, according to those older platers whose memories were searched for a similar previous occurrence.

Unfortunately, only a single phrase describing Dr. Mantell's talk was quoted giving an erroneous impression of the subject matter which was really constructive, and only critical of a reactionary type of plater fast becoming obsolete. However, the mention was the thing that counts, proving the *Reminder* is being read and it is to be hoped more notice may be taken of the things we are doing while if anyone can start a walloping big "Winchell-Bernie" in the pages of our national magazines, let him step forward and start writing, since whether he be right or wrong, the interest aroused will eventually uncover the truth and everyone will benefit from the general airing of views, whereas at present the trade literature largely presents an "Edgar Bergen-Charlie McCarthy" aspect.

The February meeting was somewhat better attended and Mr. Albert Hirsch's paper brought out considerable discussion and difference of opinion, or perhaps it were better to say misunderstanding of objective, which was confined to the effects of three bath constituents and for further information on other phases he referred questioners to Dr. Graham's more elaborate and exhaustive research on the same subject, as published serially in *Metal Industry* for the past several months, which research, incidentally, is a masterful exposition and deserves careful study by all platers whether using cyanide solutions or not.

Although more papers should have been read in order to compete for the Milwaukee Convention Branch Paper, the time was too short so that the remainder was used to introduce discussion on the proposed new Constitution and By-Laws. At the coming March 18th meeting, however, at least two papers, one by Mr. Shelly of the U. S. Gauge Co. on "Etching" and one by Mr. Fulforth of the Proctor Electric Company on "Practical Solution Maintenance," will be read and possibly our new librarian Mr. Zurbach will have his paper in order for presentation if time permits, while Mr. Mentzer is also scheduled so that in the absence of any one or two there will still be sufficient to call forth a good attendance.

It was intended to place a copy of the proposed Constitution in the hands of each member of the Branch but since there were only 100 available for distribution, these were mailed to the 100 members living nearest the city and those regularly attending meetings. These copies should in all fairness be brought to the March 18th meeting in order that those attending and not having received copies should be able to take one home for detailed study, or in the event of their inability to attend, should be mailed to the secretary in time to have him being them to the meeting. FREDERICK FULFORTH

Research Department

Mr. W. M. Phillips, Chairman of the Research Committee visits Montreal Branch and is given a great reception.

For some time the members of Montreal Branch have been debating among themselves the advisability of inviting speakers from the United States to address their meetings. It was doubtful in the minds of the members if a large enough audience could be gathered together to make the meeting worth while, desirable as an event such as this might be.

President Lariviere, John T. Cronin, Secretary, and John Feeley and others decided to take a chance and asked W. M. Phillips, Chairman of the Research Committee, to speak at the Branch on February 14. The meeting was held in the Chemistry Building, McGill University. Past National President of the A.E.S., John Feeley, presided and did a wonderful job. Mr. Phillips gave his Schlaren illustrated talk on plating conditions. When the Editor of the REVIEW wrote that this lecture was worth going miles to see, he certainly spoke the truth, and when the two hundred seats in the hall were filled, it certainly gave your Secretary great satisfaction. Many men who came from out of town points agreed that it was one of the best and most novel addresses they had ever attended on electroplating. Mr. Phillips was asked many questions after his talk and was given a great hand before leaving. Checkers at the door obtained the names of all who attended the lecture, and letters inviting those considered desirable have been mailed inviting them to join the A.E.S.

As Mr. Phillips started for Toronto to deliver his talk before that Branch, Mr. Bill Feeley came to his rescue and with the assistance of his little truck succeeded in getting the Schlaren machine to the station before the train left for Toronto. The result of the meeting encouraged activity in building up the membership of the Branch. J. T. CRONIN, *Sec.*

Mr. Phillips spoke at a special meeting of Toronto Branch on February 15, at the Mining Building of the University of Toronto. His address was similar to the one given at Montreal the previous evening. At the close of his talk the meeting was opened for discussion. The questions were varied and much knowledge was obtained from the answers given. This was the first meeting of its kind given in Toronto. President Acheson presented Mr. Phillips with a glass bottle that had a silver design plated on it as a reminder of his trip to Toronto. The work was done by one of the members. Toronto Branch made a contribution of $25.00 to the Research Fund.

We have just received a check from Mr. Walter Fraine, former Treasurer of the Research Committee, for $121.03 which covers a 5% dividend on the Research Fund in the Union Trust Co., Dayton, Ohio. This brings our returns up to 90% of the total amount deposited when the bank failed in the 1931-32 financial crisis.

Bridgeport Branch A. E. S.

EDUCATIONAL SESSION AND BANQUET

at the Stratfield Hotel . Saturday April 30, 1938

Educational Session at 2.30 P. M. Banquet at 7 P. M.
Tickets $2.50 per person.

Donald Wood, "Silver Plating"

George B. Hogaboom, "What Research Has Done for Electroplating"

George Dubpernell, "A Chart of the Chemical Elements for Electroplaters"

After the banquet there will be a floor show, followed by dancing

For reservations write to

W. H. FLAHERTY - 691 Maplewood Avenue
Bridgeport, Conn.

JUST A REMINDER

Rochester Branch 19th Annual

EDUCATIONAL MEETING AND DINNER DANCE

Saturday Apr. 30, Hotel Seneca, Rochester, N.Y.
Tickets $2.50

We are going to have some outstanding speakers at our Educational Sessions whom you cannot afford to miss hearing.

Full details will be in the April issue.

BUT

DON'T FORGET THAT DATE—SAT. APR. 30

The Abstract Section

R. M. GOODSELL, *Chairman, Program and Educational Committee*

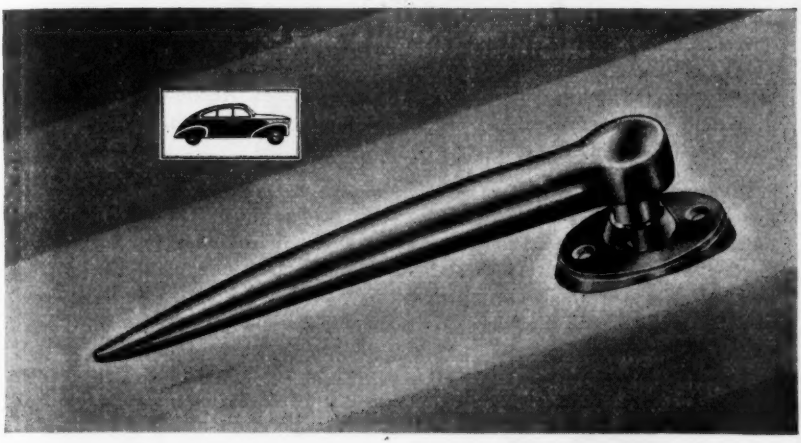
Tin Plating Aluminum Alloy Automobile Pistons by Immersion. By DALE BROWN, V. SHULBERG, and G. BELL. *Metal Industry*, Volume **36**, January, 1938—Piston fits in automobile engines are claimed to be closer than ever before in the history of the automobile industry. Tin plating is applied to the pistons which reduces the breaking in time and also eliminates danger of scuffing. The tin plating provides an initial bearing surface instead of requiring a bearing surface to be developed due to use. The article contains an outline of the operations involved in depositing the tin coatings on aluminum-alloy pistons with illustrations showing the steps in the process, and the essential specifications of each, i.e., the cleaning bath which contains 5 or 6 ounces of cleaner per gallon that will not attack the aluminum readily, an acid dip composed of 20% Nitric Acid to remove the last traces of cleaner. The immersion plating is the next step into which the pistons are dipped for 5 minutes in a solution of 6 ounces per gallon of technical sodium stannate. The factors that are maintained in this solution are the (1) temperature is carefully maintained at 175 deg.F. (2) that the tin content be held between 0.8 and 2.15 ounces per gallon, (3) that the free alkali be less than 1.25 ounces per gallon. The authors also include instructions for the chemical determination for the free alkali, tin content and calculations used for same. PAUL A. OLDAM.

Recovery of Silver. By N. HALL and G. B. HOGABOOM, JR. *Metal Industry*, Vol. **36**, January, 1938—Methods are described for the recovery of silver from silver stripping solutions and transformed into silver salts for plating. The silver which is deposited on the cathode of an electrolytic stripping solution is dissolved in nitric acid and precipitated with sodium chloride as insoluble silver chloride, then either dried or dissolved in sodium cyanide. Each ounce of silver requires approximately two thirds of an ounce of commercial sodium cyanide. Such a procedure is also adaptable for the recovery of silver from acid stripping solutions. Silver is also recovered from old or contaminated plating solutions by the zinc precipitation method. An excess of metallic zinc is introduced into the plating solution, the zinc dissolves and displaces an equivalent amount of silver, the remaining zinc is dissolved in hydrochloric acid leaving the pure silver behind. The precipitation of silver from plating solutions by sodium sulphide is also described. PAUL A. OLDAM.

A Study of Rochelle Salt-Copper Plating Bath. By A. K. GRAHAM and H. J. READ. *Metal Industry*, Volume **36**, January, 1938, Part 3—Further data on anode behavior with special reference to insoluble anodes.

Now . . . no rejects . . .

HARDWARE PLATING PERFECT AFTER *thorough* OAKITE CLEANING



Removing buffing compound from automobile door handles and window lifts was a slow, tedious job in one plant until a short time ago. Hand wiping of each part was necessary. Production was slow . . . costs were high.

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High cost of individual wiping was entirely eliminated. What is more, a brighter plate was secured.

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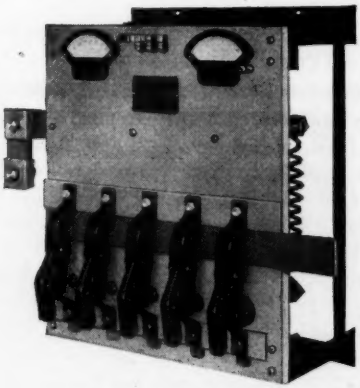
Variable bath composition is given, in reference to soluble and insoluble anodes of copper, iron and nickle, in a bath composed of 3.5 oz. CuCN, 4.6 oz. NaCN, 2.0 oz. Na_2CO_3, 4.0 oz. rochelle salts per gallon of water. Table 3 shows, limiting anode current densities and corresponding polarization and bath values. Table 4, limiting values of current density for various anode materials in the solution. Table 5, Current densities and current distribution using anodes of iron and copper of equal area. Table 6, Loss in weight of insoluble anodes in rochelle salts copper baths at various values of pH. Charts included show, Anode polarization vs. Anode current density in a bath composed as above, using soluble and insoluble anodes at a pH value of 10.7 and 12.8 respectively.

Copper anodes have been found to polarize excessively at comparatively low current densities (20 to 30 amps./sq.ft.) Insoluble anodes of iron and nickel do not polarize excessively even at high current densities. Insoluble anodes used in conjunction with soluble copper anodes depolarize the latter and permit higher anode current densities. Insoluble iron anodes have been found to suffer attack when used at a pH value of about 10.7 or less, especially in the absence of carbonates. An iron plating tank would also be attacked if in electrical circuit while operating a bath at too low a pH. Iron in the bath affects the analytical control, necessitating slight modifications of the methods, but does not apparently affect the operation of the bath or the character of deposits. PAUL A. OLDAM.

A Fungus in Acid Copper Plating Baths. By NANDOR PORGES. *Metal Industry*, Volume **36**, January, 1938—The growth of "jelly fish" which prevent the deposition of an adherent plate. A fungus has been found growing in a copper plating bath. Metals obtained from this bath, upon burnishing had a mottled appearance. The fungus grows and produces medusa or jelly-fish like colonies throughout a solution containing copper sulphate to saturation and 6.8% sulphuric acid. The jelly-fish like development is favored by tap water containing sugar rather than by nutrient solution. The identity of the fungus has not been ascertained, but further study is being made. PAUL A. OLDAM.

The Polishing Department Need More Attention. By E. W. COCHRAN. *Metal Industry*, January, 1938, Vol. **36**—A description of a polishing department is given which has been carefully laid out and is under close technical control. Correct wheels are used for each type of article with correct grain size of abrasive and temperature controlled atmosphere in drying the abrasive and glue. Other compounds, automatic handling and inspection are the other essentials mentioned. PAUL A. OLDAM.

The Recovery of Silver, Gold and Mercury from Precious Metal Amalgams. By C. M. HOKE. *Metal Industry*, Vol. **36**, January, 1938—Silver amalgam that is used in the dentistry arts, and gold amalgams which are found occasionally in jewelry shops, consist of the following process for the recovery; (a) Distilling off the mercury by heating over an open fire, or by



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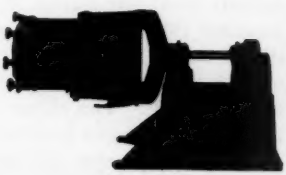

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DEALERS IN PRINCIPAL CITIES

the retorting method, a sketch is shown for the retort hook up, (b) Melting up the residual metal, (c) Purifying the silver and gold. PAUL A. OLDAM.

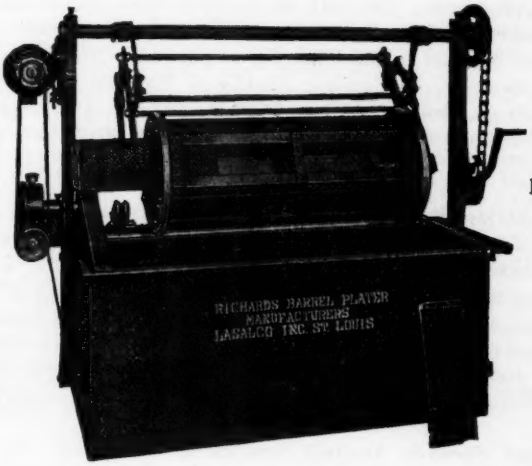
Plating Copper on Aluminum. (An extended abstract.) By WALTER R. MEYER. *Metal Industry*, Volume **36**, 2, Feb., 1938—Methods have been developed which embody an electro-chemical oxidation to artificially strengthen the oxide film. The oxide film is loosened in the alkaline solution thus creating a skeleton type of foundation upon which the metal being deposited firmly anchors itself. The operations involved are: Clean in cold 10% caustic soda (10 minutes) and neutralize in 2% hydrochloric acid solution. Immerse 15 minutes in a hot mixture of sodium carbonate and sodium monochromate or sodium vanadate followed by rinsing in cold water. Then copper plating in the following solution: Copper sulphate 150 gr/L, Sulphuric acid 60 gr/L, Gelatine .01 to .1 gr/L, Current Density 10-11 amps/ft., Time 60-90 minutes, Temperature 20-25 deg.C. PAUL A. OLDAM.

Fabricating Properties of Nickel Silver as Affected by its Chemical Composition. By B. EGEBERG and N. E. PROMISEL. *Metal Industry*, Volume 36, No. 2, Feb., 1938—Laboratory and plant experiments show that in 18% nickel silver intended for severe cold deformation the zinc content could not exceed 20% if a smooth surface is required. In general, annealed 18% nickel silver of the standard composition (65 copper, 17 zinc) should have a hardness in the range B30-45 Rockwell and a grain diameter of .025-.037 millimeter. This is obtained by annealing in a range of 1200 to 1350 deg.F. The higher zinc content alloys work harder, faster and require therefore more frequent anneals, also higher annealing temperatures in order to be softened sufficiently for further cold working. For severe deep drawing purposes the zinc content may advantageously be less (10 to 15%). PAUL A. OLDAM.

Inhibitors in Acid Pickling. By Dr. J. C. WARNER. *Metal Cleaning and Finishing*, Feb., 1938—The theory of metallic and organic inhibitors is discussed. Arsenious, Antimonious, Tin, or Mercury compounds inhibit the action of sulfuric acid on iron. Antimonious compounds can be used successfully to protect iron, cobalt, or nickel from attack while coatings of zinc, cadmium, tin, or chromium are stripped in 25-30 per cent Hydrochloric acid. Metallic inhibitors are displaced by the basis metal forming a coating which forms a cathode surface upon which a higher potential is required for hydrogen evolution at equal current densities. Organic compounds which possess inhibitor properties contain nitrogen, oxygen, sulfur, or other elements in the fifth or sixth periodic groups. The inhibitor must consist of a hydrocarbon part attached to a highly polar or ionizable group. Very small concentrations of these organic inhibitors cause a great decrease in the rate of hydrogen evolution. Commercial testing and selection of inhibitors is also discussed.

Directions for Electroplating of Aluminum. By R. E. BLUE and F. S. MATHEWS. *Metal Cleaning and Finishing*, Feb., 1938—The authors

Made in Four Sizes



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described a bath developed at the Indiana University laboratory which has practical applications. The bath is prepared from aluminum, aluminum bromide, and aluminum chloride dissolved in a mixture of benzene and ethylene bromide in the following proportions: Aluminum, 33 grams; Aluminum Bromide, 165 grams; Aluminum Chloride, 165 grams; Ethyl Bromide, 330 cc; Benzene, 670 cc; Xylene, 330 cc. The method for preparing the bath, operating details, and maintenance of the bath is discussed.
EDMUND S. JEVELI.

Copper Oxide Rectifiers for Electro-Chemical Uses. By I. R. SMITH. *Metal Cleaning and Finishing*, January, Page 10—Recent improvements in copper oxide rectifiers make available a new tool for electroplating. Rectifiers are made up of sheets of copper, oxidized on both sides with the cuprous form of copper. Current flows freely from copper oxide to copper (copper negative). Resistance of copper sheet increased when current flows from copper (copper positive) to copper oxide. Ratio of resistance to current flow as high as 10,000 to 1. Characteristics of rectifiers listed.

Why Rust Spreads Around Scratch or Abrasion. By PARKER RUST PROOF CO. *Metal Cleaning and Finishing*, February, Page 120—Cause of rust is chemical action resulting from electrolysis. Dissolving iron or steel develops alkali which creeps back between metal and applied finish. Immersion of a steel panel in agar-agar solution impregnated with potassium ferrocyanide and phenolphthalein prove formation of hydroxyl ion at electro positive area by pink coloration, and ferrous ion at electro negative area by blue coloration.

NEWARK BRANCH

Annual Educational Session and Banquet

at the HOTEL DOUGLAS

Saturday, April 23, 1938

Educational Session at 2 P. M. Banquet at 7 P. M.

Tickets $3.00

••••

Speakers:

N. PROMISEL, International Silver Co.

ALBERT HIRSCH, Snyder Inc., Philadelphia

E. N. BUCY, Zapon Co., Stamford, Conn.

T. H. CHAMBERLAIN, New Haven Clock Co.

••••

Afternoon Entertainment for the Ladies

GEORGE WAGNER, Secretary

NEW NOTES ON THE CONVENTION

The Convention Committee held a special meeting at the Hotel Schroeder last Thursday evening March 3. The various committees made their reports and from all indications, the plans have been pretty well completed in all directions for making this a grand and glorious event.

A picnic will be held at Waukesha Beach, a few miles out of Milwaukee. This is a delightful place where you will have a chance to swim, dance and in general, have the time of your life. It is here that the greatest ball game of the year will take place; the East vs. the West. I have been told that Tom Troumbour will be the Captain for the East and Jack Geissman for the West. Cyanide Bill, Official Umpire, who, I have been informed, will be equally unfair to both teams. No holds will be barred and may the best team win.

There will also be Shop Visitation; trips through some of Milwaukee's largest job plating shops.

The Men's Registration fee will be $6.00 and the Ladies' fee will be $4.00. Be sure to start making early plans now to attend. Mr. Herrmann, who has charge of the Hotel Reservations, reported that he has already made reservations for one couple coming from Pittsburgh, Pa.

We are also presenting a list of speakers and papers to be presented with the exception of a few titles to be announced at a later date.

INDIVIDUAL PAPERS

WALTER MEYER, General Electric Co., Bridgeport, Conn.
Subject: The Effect of Metallic Impurities on the Structure of Cyanide Copper Deposits.

GEORGE HOGABOOM, Hanson-Van Winkle-Munning Co., Matawan, N.J.
Subject: History of Metal Coloring.

FLOYD OPLINGER, R. & H. Chemicals Div., of DuPont Co., Niagara Falls, N.Y.
Subject: To be announced.

GUSTAVE SODERBERG, Udylite Co., Detroit, Michigan.
Subject: Bright Nickel.

W. PINNER and G. BORCHARDT, General Spring Bumper Co.,
Subject: Importance of Correct Anode Corrosion in Electrodeposition of Nickel.

ED. BUCY, Zapon Division, Atlas Powder Co., Stamford, Conn.
Subject: Industrial Finish Manufacture.

DR. MITCHELL, Magnus Chemical Co., Garwood, N. J.
Subject: Use of Solvent Emulsions in Metal Cleaning.

DR. WM. BLUM, Bureau of Standards.
Subject: Report.

PAUL STRAUSSER, A.E.S. Research Man, U. S. Bureau of Standards.
Subject: Report.

BRANCH PAPERS

ANDERSON: Rochelle Salts-Copper Cyanide Solution.
DETROIT: Electroplating Solves Manufacturing Problems.
NEWARK: Wetting Agents in Plating Solutions.
SPRINGFIELD: Answers to 101 Questions on Copper Plating.
HARTFORD: Dips and Their Uses in the Plating Cycle.
PHILADELPHIA: Title Unannounced.
BOSTON: Title Unannounced.
WATERBURY: Title Unannounced.
DAYTON: Title Unannounced.

ROBERT B. GOODSELL, *Publicity Chairman.*

Inhibitors in Acid Pickling. By Dr. F. C. WARNER. *Metal Cleaning and Finishing*, February, page 104—Organic compounds, which are derivatives of coal tar and acid sludge from oil refineries, containing nitrogen, oxygen, and sulphur, are the most commonly used in electrolytic pickles. Molecules, after absorption on surface of metal, arrange themselves at definite angles to surface, forming a protective film. Hydrogen evolution decreased by increased overall cathode polarization. Properties of satisfactory inhibitors listed.

Directions for Electroplating of Aluminum. By R. E. BLUE and F. C. MATHERS. *Metal Cleaning and Finishing*, February, Page 114—Previous aluminum plating baths found to be impractical due to poor deposit and to the necessity of protecting bath from air. Bath developed by R. E. Blue and F. C. Mathers improves on these disadvantages. Authors' formula for 1 litre of solution:

	By Weight	*By Metric Units*
Aluminum	33	33 Grams
Aluminum Bromide	165	165 "
Aluminum Chloride	165	165 "
Ethyl Bromide	472	330 cc
Benzene	600	670 cc
Xylene	290	330 cc

Bath carries own protecting coating of xylene and benzene. Operating temperature is 68 to 77°F. Cathode current density is 10 to 20 amperes per sq. ft. 25 cc. ethyl bromide per 100 hours of use, is the only addition agent required. Method given is for the preparation of bath.

Testing and Stripping of Electro-Deposits. By Dr. B. EGEBERG and N. E. PROMISEL. *Metal Cleaning and Finishing*, January, 1938, Page 30—The ability of tin to withstand corrosion makes it a highly desired coating. To differentiate it from cadmium and zinc usually requires chemical analysis. Stripping may be done by one of three methods:

1. Using a solution of 20 grams of antimony trioxide in cold slightly dilute hydrochloric acid.
2. Using a boiling solution of sodium plumbite prepared by adding a solution of 80 grams of lead acetate in 500 cc of water to a solution of 135 grams of sodium hydroxide in 500 c c of water.
3. Using a 5% solution of sodium hydroxide electrolytically.

The voltage on the last method should be below 1 volt with the solution at 85°F. The thickness of the deposit after stripping may be computed from the following formulae:

$$\text{Average thickness (in inches)} = \frac{\text{Loss in weight (in dwt)} \times 0.013}{\text{Area (square inches)}}$$

$$\text{Average thickness (in grams)} = \frac{\text{Loss in weight (in grams)} \times 0.14}{\text{Area (in square cm).}}$$

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IV	1.2 — 3.4	VII	11.0 — 13.5
V	0.9 — 1.5		

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METALS AND ALLOYS:

PHIL J. RITZENTHALER

1. Electrolytically deposited metals with variable properties. MAX SCHLÖTTER. *Research Progress*, Vol **3**, June, 1937, pp. 159-162—Historical review of phenomen observed on various electrodeposited metals. Owing to inclusions of compounds of the metal in the deposited metal lattice, there are sometimes marked differences in the physical and chemical properties from those of pure metal. Electrodeposited Ag containing Iodine (lattice expansion) is passive against sulfur compounds. By absorption of iodine, copper becomes hard, brittle and so sensitive to light that in sunlight deposit is blue. Nickel containing nickel-oxygen inclusions has a lower surface tension than lustrous electrolytic chrome. Electrolysis of zinc solutions does not yield pure zinc. Discusses pure metals from theoretical standpoint.

2. Electrodeposited Coatings on Aluminum and Its Alloys by Elytal Process. H. GINSBERG. *Aluminum*, Vol. **19**, June 1937, pp. 381-384—The Elytal process consists in anodic production of an oxide layer which adheres to the Al more firmly than the natural oxide layer. The latter must be carefully removed when electrolytic deposits are desired on aluminum. German patent 606,850 describes oxidation in a bath of P^2O^5 followed by loosening of the layer in an alkaline bath at about 80°C. so that a kind of oxide network is formed on which the deposited metal firmly adheres. Rolled or cast pure aluminum, Al-Cu-Mg and Al-Cu-Zn alloys can be treated.

3. Barrel Finishing of Metal Products, Article 13; Use of Cream of Tartar as a Burnishing Medium. H. LEROY BEAVER—Author checked in on use of cream of tartar as burnishing medium, but found difficulty in getting exact information. Best data obtained gives satisfactory medium consisting of both cream of tartar and soap bark. Either alone not as good. Ordinary soaps not as good as soap bark with the tartar. Two parts cream of tartar to one part soap bark. Pyrophosphate also may be substituted for cream of tartar to cut cost. Cream of tartar no good on steel and also tends to pit steel burnishing balls if they are stored in a tartar solution.

SOLUTION ANALYSES—GEORGE WAGNER, Newark Branch

ANALYSIS OF CYANIDE COPPER SOLUTION
For Metallic Copper

1. Pipette a 2½ cc. sample into a 250 cc. beaker
2. Add 10 cc. C.P. Nitric Acid (under a hood)
3. Boil for 2 to 3 minutes to expel nitrous oxide fumes and also Hydrocyanic acid fumes.
4. Add 25 cc. water
5. Add C.P. Ammonia until solution turns blue indicating it is alkaline
6. Heat to boiling and add C.P. Hydrochloric Acid until solution is acid to litmus paper
7. Dilute to 200 cc. with water
8. Add 2-3 grams of potassium iodide
9. Add soluble starch indicator to solution and titrate to white end-point with tenth-normal sodium thiosulfate
10. c.c. Thiosulfate x .336 = oz/gallon copper

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ANALYSIS OF BRASS SOLUTION
For Metallic Copper and Metallic Zinc

(A) *Copper Content*

1. Take a 2½ cc. sample of solution and proceed exactly as in cyanide copper analysis

(B) *Zinc Content*

1. Pipette a 5 cc. sample into a 250 cc. beaker and add 25 cc. of water
2. Add 10 cc. of 10% Sodium Sulfide Solution
3. Heat nearly to boiling and filter through a Munktell's No. 00 filter paper
4. Wash filter paper twice with hot (not boiling) water
5. Transfer filter paper holding precipitate back to the beaker
6. Add 20.0 cc. of .1 Normal Iodine Solution to beaker
7. Add approximately 20 cc. of C.P. Hydrochloric Acid
8. Warm solution and stir well
9. Add Soluble Starch Indicator to solution and titrate with .1 Normal Sodium Thiosulfate to white end point
10. (cc. Iodine-cc. Thiosulfate) x .087 = ounces Zinc per gallon

ANALYSIS OF CADMIUM SOLUTION
For Metallic Cadmium

1. Pipette 2½ cc. sample into a 250 cc. beaker
2. Add 10 cc. of 10% Sodium Sulfide Solution
3. Heat (but do not boil) and filter through a No. 00 Munktell's filter paper
4. Wash ppt. twice with hot (but not boiling) water
5. Transfer filter paper and precipitate back to the beaker
6. Add 30.0 cc. of .1 Normal Iodine Solution
7. Add approximately 20 cc. Hydrochloric Acid
8. Warm solution and stir well
9. Add Soluble Starch Indicator and titrate with .1 Normal Thiosulfate to white end point
10. (cc. Iodine-cc. Thiosulfate) x .30 = ounces Cadmium per gallon

ANALYSIS OF CYANIDE ZINC SOLUTION
For Metallic Zinc

1. Pipette a 1 cc. sample into a 250 cc. beaker and add 25 cc. water
2. Add 10 cc. of 10% Sodium Sulfide Solution
3. Heat nearly to boiling and filter through a No. 00 Munktell's filter paper
4. Wash filter paper twice with warm water
5. Transfer filter paper holding precipitate back to the beaker
6. Add 30.0 cc. of .1 Normal Iodine Solution
7. Add approximately 20 cc. of C.P. Hydrochloric Acid
8. Warm solution and stir well
9. Add Soluble Starch Indicator to solution and titrate with .1 Normal Thiosulfate to white end-point
10. (cc. Iodine-cc. Thiosulfate) x .435 = ounces of Zinc per gallon

STANDARD SOLUTIONS

Tenth Normal Iodine Solution. Dissolve 30-35 grams of C.P. Potassium Iodide in 200 cc. of water and add 12.700 grams of C.P. Resublimed Iodine Crystals. Dilute this to one liter in a volumetric flask.

Tenth Normal Sodium Thiosulfate. Dissolve 24.822 grams of C.P. Sodium Thiosulfate crystals and dilute to 1 liter in a volumetric flask.

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